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COMPARATIVE PSYCHOLOGY AND HYGIENE OF THE OVER-WEIGHT CHILD

BY

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PREFACE

The following pages represent an endeavor to see by experimental analysis if the psychology and hygiene of the over-weight child differs from that of normal-weight and under-weight children, and if our negligence of the question as a problem is justifiable. More specifically, the purpose is a comparative study of three weight-groups of children to confirm, modify, or destroy certain traditional beliefs about over-weight people as regards their physical, mental, emotional, educational, and social make-up. Of the many different questions which might arise in the consideration of such a study, an attempt has been made to throw some light, at least tentatively, on such questions as: Is there a relationship between mental potentialities and body-weight? Does the possession of pounds of weight condition achievement? Does a child accustomed to being rated as over-weight suffer thereby? What are the causes of weight?

One could spend several years or a lifetime on these questions as their solutions depend upon the previous solution of a goodly number of other problems, but the demands of time have set the limits of this investigation. No pretense is made at being an authority in biology, psychology, endocrinology, nutrition, and the other fields touched upon in this study; the writer has simply been a student giving these subjects such attention as possible during a fairly busy life.

Preceding the report of the experiment a resumé of studies of the over-weight in other fields is given in which an attempt has been made to cover only those which are relevant and from which suggestions have been taken. The vocabulary of this part seems extremely technical but it was exceedingly difficult to find synonyms to express the concepts of the authors.

Since this study deals with subjects secured from schools rather than from laboratories and other institutions, it was impossible to secure children who fulfilled the criteria from other than elementary schools, with the exception of three volunteers from the first year of the Horace Mann High School, since the secondary schools were reluctant to allow the time for each pupil which was equivalent to an average of sixteen hours per person. It was also impossible to secure the coöperation of all for the basal metabolism and other tests which could not be given in the respective schools but which had to be given in the Nutrition Laboratory to insure proper conditions; consequently, there are incomplete data for all who did not have the basal metabolism test.

However slight the positive contribution of this study, it has at least introduced the writer to the literature on the problem of over-weight in other fields and aroused a keen realization of the fact that the field is a promising one for experimental investigation. No doubt some or all of the conclusions stated are still debatable and may finally be rejected. The appeal of these data is to the educator and to those who deal with people.

As a final word, it is with great and genuine pleasure that I may have this opportunity to express my appreciation and thanks to Dr. L. S. Hollingworth, whose direction and inspiration has been most helpful and encouraging; to Drs. A. L. Rogers (of Bryn Mawr College), R. Pintner, A. I. Gates, H. A. Ruger, for the guidance and aid during the initial organization of the material included in this investigation; for the generous assistance given by Hugh Rowell, M. D., and Dr. F. G. Bonser, and the loan of trained assistants by them for certain special phases of this work; for the invaluable support, coöperation, and encouragement of Dr. G. MacLeod of the Nutrition department, assisted by students of the department, in the basal metabolism determinations; for the many helpful suggestions, interest in the work, the loan and gift of books and the like, by R. Burton-Opitz, M. D., Ira S. Wile, M. D. of Mt. Sinai Hospital, W. Timme, M. D. of Neurological Institute, J. H. Means, M. D. and F. B. Talbot, M. D. of the Massachusetts General Hospital, T. H. Weisenberg, M.D. of the University of Pennsylvania Graduate Medical School, Wm. Englebach, M. D. of the St. Louis Englebach Clinic; for the permission to use the time of pupils and their aid and cooperation, much special credit is due to the principals of schools: Mr. H. C. Pearson, of the Horace Mann School, Miss J. E. Monahan of P. S. No. 165, Miss J. M. Cummings of P. S. No. 179, Misses L. Charlton and L. V. Sheehan of P. S. No. 93, Dr. J. F. Reigart of P. S. No. 166, Mr. S. Viertel and Mr. E. Weinstein of P. S. No. 43; finally, for the contributions of a host of others, which although not specially mentioned, are none the less valuable.

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COMPARATIVE PSYCHOLOGY AND HYGIENE OF THE OVER-WEIGHT CHILD

CHAPTER I

VARIOUS CONTROVERSIAL HYPOTHESES AS TO THE CAUSES AND EFFECTS OF ADIPOSITY

Although their bearing on this study is only that of a summary of previous work done in related fields, it was decided to review some of the various hypotheses as to the causes and effects of adiposity which are found in the literature. The psychological and educational annals of research, up to the present time, contain very little that has a direct bearing on the interpretation of the over-weight and the medical annals scarcely more, but a great deal of an indirect nature. All of the results found in the literature are still very controversial as they depend upon the solution of a great number of other problems; the following pages of this chapter suggest some of the major controversies.

SPECULATION OF THE LAYMAN

Certain convictions are held by many that the mere possession of superabundant adipose deposits endows the owner with good humor and nature, but the burden of the "too, too solid flesh" which Falstaff bore does not preclude the possession of genius, "brains," character, duplicity, or all the other virtues, vices, or ignoble truths that some would contend, as they would have red-haired people possessing certain peculiarities of temper as being singular to them. Interestingly enough, there are no determined facts to prove that because a man is inordinately fat he is prevented from being inordinately clever or a genius nor is it proved that it is essential that he should be easy-going.

THE FUNCTION OF FAT

From physiology we learn that body fat serves several purposes: it is a store house for sustaining the vital fire and drives the human machine; it serves also to retain the body heat as an asbestos covering; it serves as a protective covering for the entire body even for such a delicate organ as the globe of the eye; it provides a soft even bed for the skin to rest upon. Fat is a concentrated form of fuel, yielding heat and driving power necessary to the degree demanded by the place and function of the animal but demanded to some degree by each in accordance. Exposure to cold causes the fire to burn more briskly and to consume more fuel in order to maintain the body heat; exercise has a similar effect. It takes a long time to die of starvation if one is kept warm and quiet; therefore warmth, quiescence, with food containing fat, starch, and sugar make for fatness, while cold, muscular exercise, and the intake of non-fattening food make for thinness. There are other factors at work, however, than these. They consist of certain substances circulating in the blood, substances which determine the rate at which combustion takes place in the body. Foremost are the endocrine glands with their secretions controlling the metabolic processes. The chief endocrine organ in control is the thyroid gland yielding a secretion known as thyroxin [78]* which acts as a catalyzer or the bellows to the vital fire causing the fuel of the body to burn at an increased rate. With a lessening of the amount of secretion the vital fire is dampened down, it smoulders rather than blazes, and as a consequence the fuel is not utilized but stored as fat in the tissues. The posterior lobe of the pituitary gland with its active agent pituitrin has the same function as the thyroid gland as regards its influence upon metabolism, the medulla of the adrenal cortex with its hormone epinephrin likewise [10]. A dysfunction in one endocrine gland, seemingly, effects the others either by a compensating reaction or the contrary, as interaction among the endoctrine glands is exceedingly great [5,71].

OBESITY

The exogenous [37] obese is the technical name for those cases in which the only discoverable cause may be explained on the basis of life habits as lack of exercise, increased food intake or over-eating [47], an excess use of fats and carbohydrates [51], and family idiosyncrasies [26] (as families in whose homes the huge meal is the accepted mode). These cases supposedly are ones in which there are fluctuating body-weight histories and which are easily corrected by removing the individual from the cause, usually food. A reduction of calory intake figured on the basis of the calory need of these individuals is usually the only therapy necessary for them to lose weight.

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* Throughout this study, numbers in brackets refer to correspondingly numbered references in the Bibliography, pp. 117 to 123.

The endogenous [5,10,37,56] or constitutional group of obesities comprises those cases in which there is a more or less well defined pathological etiology explained as a dysfunction of one or more endocrine glands, depending upon the age of obesity onset and the localization of fat pads. These cases are ones whose histories show a repetition of prolonged hygienic, hydrotherapeutic, and gymnastic efforts to reduce with comparatively little effect. The deduction is then that when individuals, free from general or systematic diseases other than those of the endocrine glands (such as malignancy, infection, or lesions, retarding in any way the intake or assimilation of food through a decrease in appetite, a structural or chemical change), persist in having a history of obesity the cause must be in the katabolism and not in the anabolism of metabolism. In other words, it is not the amount of food consumed or the amount of exercise taken but the amount of food after it is properly anabolized (constructive metabolism for repair of function) which is either stored in the body or broken down by katabolism (destructive metabolism for dissimilation or disintegration) and excreted which produces the proper balance in weight. It is in this rôle of metabolic activity regulation that the endocrines play their important part. Many authorities [120] claim exogenous obesity is differentiated from endogenous obesity by the computation of the oxygen consumption familiarly known as the basal metabolic rate, i.e., an individual whose obesity is of endocrine origin will have a low basal metabolic rate showing a disturbance of endocrine functioning particularly that of the thyroid gland. The metabolic rate, however, does not serve to show the origin of obesity caused from an uncomplicated disorder of the pituitary or gonads, in which instances the metabolic rate has repeatedly been shown to vary but little from the norm though a dysfunction of these glands does disturb metabolism. Studies of blood fat [79] are being made to find some additional evidence on the etiology of adiposities due to pituitary and gonad insufficiencies. So far the only approximately reliable index to a diagnosis of these glandular insufficiencies is the clinical examination for the classical signs usually associated with these disturbances.

The age incidence in which obesity occurs and the localization and distribution of fat to the trained clinician are valuable aids [37, 50] in diagnosing the endocrines at fault in cases of endogenous obesity. The age incidence divisions and the characteristics are: (1) *Infantile Adiposity*—children who are over-weight (excluding monsters and the hydrocephalic) at birth (7½ to 8 pounds being considered normal) are considered to be hypothyroid. If hypothyroidism is exceedingly pronounced many of the localized hormonic signs of cretinism are present as: orthodental and osseous change defects, deep set eyes, retroussé nose, thick lips, pot belly, umbilical hernia, dermal and hair changes. The majority, however, have but few, if any, of these localized signs to any marked degree and usually lose their weight before two years of age because of disturbed nutrition induced by difficult feeding and the susceptibility to infectious diseases characteristic of hypothyroid children. For this reason, children after three or four who are over-weight probably are not hypothyroid or if they are have added an insufficiency of the hypophysis or pituitary gland. The localization and the distribution of body fat is characterized in thyroid adiposity by the usual dorsal hand padding, supraclavicular padding, and evenly distributed universal adiposity (not obvious in the first year as it is almost absent except in a very small percentage of cases even in marked cretinism). (2) *Juvenile Adiposity*—children who become adipose usually between the ages of from five to fourteen contrast quite decidedly with those with Infantile Adiposity, because of an entirely different gland disorder, namely, an insufficiency of the posterior lobe of the pituitary gland. The history of the great majority shows that they are children who weighed less than seven pounds at birth and that they were free from a chronological history of hypothyroidism, or that development throughout infantile life was normal until four or five years of age when between this age and adolescence they suddenly took on adiposity which within a few years produced disproportionate over-weight. These children do not have localized hormonic signs nor the mental retardation which is associated with the hypothyroid child; on the contrary, the majority of them are inclined to be precocious in mentality. The localization and distribution of the weight in these cases is located about the girdle, hip and shoulder girdles both being involved; the pelvic girdle adiposity extends from the naval down to the juncture of the middle and lower thirds of the thigh, the shoulder girdle is less prominently affected, although where there is a decided pelvic girdle adiposity there usually is a demarcated shoulder obesity which extends from the mid-clavicular region down to the insertion of the deltoid. Besides these local areas there is considerable fat folding about the lower part of the thorax, particularly in the lateral region. Contrasted with the thyroid cases the distal extremities (forearm, hands, ankles and feet) are usually free from panniculus adiposis infiltration exhibiting many bony markings. In pituitary obesity there is a marked contrast with the hypogonad individual who has a tendency to emaciation, over-growth of the long bones, and eunuchoid measurements which signs may occur in the juvenile, pre-adult, and adult ages. In the cases with an insufficiency of the anterior lobe of the pituitary gland there are infantile genitalia with slight adiposity in the mammary region not as marked as in true gonad insufficiency nor in bi-lobar pituitary insufficiency called Froelich's syndrome (adiposis genitalis) which is characterized by great adiposity in the mammary and mons veneris regions. The interesting fact to be emphasized is that when there is the juvenile adiposity picture it is due in the majority of cases to an insufficiency of the posterior lobe of the pituitary gland. (3) *Adult Adiposity*—adiposities occurring in pre-adult or adult ages are generally due to a disorder of the pituitary, the thyroid, or the gonads, or a combination of these glands. The age incidence of the adiposity is important here in its relation to gonad adiposity since typical gonad adiposity rarely occurs before the age of thirty-four or thirty-five; therefore, an obesity of glandular origin occurring before this age probably would be due to a pituitary, a thyroid, or a pluri-glandular syndrome but rarely, if ever, to an insufficiency of the gonads. On the other hand, it is well known that pituitary adiposity as well as thyroid adiposity can occur much earlier or later in life than in the third decade but it is highly probable that all which do occur after thirty and have a duration of a year or more involve more than one gland; the later in life the adiposity occurs the more certain it is that a pluri-glandular defect is present, and the same is true of the duration of adiposity in adult life, i.e., the longer it has been present the greater liability that more than one gland is involved though it began with a uni-glandular disturbance. As to the localizaton and distribution of fat characteristic of a pluri-glandular obesity there is a blending or a fusion of a number of typical adiposities with probably the oldest one in point of time of dysfunction and persistence dominating the clinical picture. (4) *Gonad Adiposity*—the most striking fact about this type of adiposity is the complete absence of adiposity until about the age of thirty-five with the exception of that around the trochanter region. This adiposity seems to be more marked and frequent in the female although early castrates and eunuchs in the male do show it before the age of thirty-four or thirty-five when the classical gonad adiposity usually appears. Gonad adiposity consists of disproportionate mammary enlargement as compared with the adiposity in other portions of the body but in addition there is an apron of mons veneris shelving and decided localized trochanter padding with an even diffuse fullness of the upper thigh extending to the knees. The neck, supraclavicular regions, shoulder girdle, and distal extremities are entirely free from adiposis.

GLAND THERAPY

Adequate treatment in endogenous obesity depends upon an early and complete diagnosis, preferably by a specialist in endocrine gland therapy, of the glands involved in producing the abnormality [60, 66, 104]. An early diagnosis, while there is still an opportunity to stimulate the physiologic activiy of the internal secretions at fault, will prevent other glands from becoming disturbed which condition usually hinders the success of any kind of therapy. Treatment has been principally the giving of thyroid extract and hypodermic injections depending upon the glandular deficiency. Glandular therapy [11,109] for the most part is still on the trial-error-success plane and necessarily so because: (1) much of any glandular extract given by way of the mouth is digested by the individual; (2) substitution treatment has not been given in sufficient dosage; (3) insufficient amounts of the active principle of glands have been given subcutaneously or intravenously; (4) hypodermic injections have not been sufficiently frequent. Regardless, where the diagnosis and therapy have been early and under the guidance of a competent endocrinologist the results have been positive and enduring [112].

THE HISTOLOGY OF FAT

The histology of fat indicates it to be a tissue which needs oxygen so that the lungs must work for it, it needs daily food so the digestive organs must assimilate an extra amount to care for it, the muscles must carry it around, and the spleen, liver, and other organs (except perhaps the brain) must contribute to its upkeep (the kidneys suffer perhaps the most as the excretory products of this tissue must be removed). One analysis [7] of the histology of fat gives the following: each minute lobule (1/16 of a cubic inch) is supplied with an arteriole which breaks up within the lobule into a fine capillary meshwork gathered usually into two veins; in one cubic inch of fat there are about 3096 lobules each with an arteriole, a capillary mesh, and two veins; the linear measure of arterioles and veins is about thirty inches, and a capillary mesh at least sixty by thirty or eighteen hundred inches; a pound of fat constitutes about thirty inches so in each pound of fat there is a linear measure of blood vessels approximating 5/6 of a mile,—therefore in thirty pounds of fat (the ordinary excess of 4/5 of Caucasian adults) there are about twenty-five miles of extra blood vessels through which the heart has to pump blood every 5/6 of a second or less. However, some authorities would dispute any such regular relative increment theory.

An apparently inexplicable gain in weight has never been given real importance as to its possible influence upon the future health of the bearer. The loss of weight has always been taken to indicate some very serious abnormality worthy of exhaustive investigation. On the contrary, gain in weight has always been heralded as a sign of unusual health and has constantly been the reason for minimizing any serious conditions associated with it. Disadvantages of weight from the health point of view are many. To carry about the equivalent of another person not only reduces the efficiency of that person but his life span as well, according to all actuaries. The handicap is in infectious diseases as pneumonia because the kidneys, heart, lungs, and blood supply are not available for the struggle.

CHAPTER II

PROCEDURE OF THE PRESENT STUDY

THE PROBLEM

The first problem was the task of locating the desired number of subjects for three groups of a degree of weight that would rate them well within the per cents set as selection standards for over-weight, normal-weight, and under-weight human beings. It was also desired to secure the same number of subjects for each group within each school so that the findings on the various achievement tests would not be affected by the concentration of numbers in any one body-weight group for any one school. It was not considered feasible to attempt to take more than one age group, desirable as that would have been, because of time limitations, cost for great numbers of test blanks, and the labor of giving and scoring.

The next problem was the one of selecting the best procedure for obtaining the comparative data desired. The plan of the investigation called for the collection of data that would give information about the physical, mental, educational, emotional, and social profiles of these groups. It is evident that the success of an undertaking of the kind here described depends in no small measure upon the time and the correct experimental conditions secured for it. Herein lies the limitations of this study, in that its scope was conditioned by the inability of the school authorities to permit the loan of their pupils for longer periods of time and for the study of them as groups outside the school during school hours under more highly controlled conditions; the extra-curricular activity programs further prevented any study of them as groups after school hours and on Saturdays so that these hours were reserved for the individual study part of the plan. These facts necessarily caused the time available to be budgeted, the tests and other measures to be selected in accordance, as well as questionnaires and other personal data sheets to be economically planned.

SELECTION OF GROUPS

It was decided to use the age of eleven years for the inclusion of subjects in the experimental groups since that age has been marked as the approximate beginning of the third period of metamorphosis [1,81]. According to Broman's measurements and those of others, during the ages of eight, nine, and ten, the body increases more in volume than in length, while at eleven years of age the length increase overtakes the body increase (and after that year, passes it), thus indicating that there may be a more constant or direct relationship between height and weight at this age than at any preceding or succeeding age.

The respective schools were visited in order and all children in each school from eleven years through eleven years eleven months of age were measured, on or before the first day of the following month, for height and weight. The per cents of deviations from the so-called norms set by the Baldwin-Wood Height-Weight-Age Tables were found, and the children were nominated, in so far as it was possible, to one of the three groups in accordance with the accepted criteria [36, 43, 121] set for body-weight groups; namely, those who were 15 per cent and over the weight standard for their height and age were the nominees for the over-weight group, those who were within 5 per cent plus or minus were assigned to the normal group, and those who were 8 per cent and below were delegated to the under-weight group. There was one exception to this nomination procedure in order to secure the same number of subjects from each school for each group so as not to weight the results by a preponderance of numbers in any one group,—percentages may be seen to deviate from those designated but in all cases an attempt has been made to select those nearest the criterion per cent of selection for that group. These cases, obviously, had to be selected from the weight deviation ranges otherwise excluded from the study, namely, from those cases between plus 5 per cent normal and 15 per cent over-weight and from those between minus 5 per cent normal and 8 per cent under-weight.

The search for subjects continued until it was thought, considering the possibility of loss of subjects, that the net yield would approximate a total number of three hundred or one hundred for each body-weight group with fifty of each sex for each group. In all about three hundred and thirty children were studied, but the net number recorded is 312 with 104 for each group and 52 for each sex of each group. The search for subjects was carried on only in those schools in which the authorities could and would coöperate immediately, thus resulting in the inclusion of subjects from six typical public elementary schools of varied school populations and one typical private school. Although the full quota desired was obtained, it is believed that a considerable loss was incurred by the inability to include more private schools (two other private schools were willing to coöperate but were deterred by administrative formalities) as they would probably have given a wider range of potentialities for each group.

SELECTION OF MEASURES

The plan of the investigation called for the collection of about fifty-two pages of test and measurement data and about seventeen pages of questionnaire information for each child, not including the additional data for those children having such special tests as the basal metabolism test and other tests given on the same morning.

The data collected for the study included the following:

1. A blank filled out by the parents, giving the racial and social origin of each child as well as the approximate history of weight maintained throughout the life of the child and his family, both near and remote.
2. Another blank filled out by the parents, showing the quantitative consumption of food by the child at meals and between meals for a normal week.
3. Health and physical records giving the stage of maturation, metabolism test results, the respiration rate, endocrine clinical signs and symptoms, etc.
4. Anthropometric measurements and tests of physical and motor capacity for all children but special measurements for some as the nutrition index determinations.
5. A questionnaire filled out by the child, giving his moral, hygienic, and æsthetic reactions as to his condition of weight.
6. A questionnaire filled out by the child, giving his likes and dislikes as to his present state.
7. The Stanford Revision of the Binet-Simon Intelligence Test.
8. School achievement tests: the Morrison-McCall Spelling Test, List I; the Woody-McCall Arithmetic Test, Form III; and the Thorndike-McCall Reading Test, Form 7.

9. The Woodworth-Matthews Personal Data Sheet for the pre-adolescent.
10. The Downey-Will Temperament Test.
11. The Gates Social Perception Test.
12. The Terman Test of Interest in Plays, Games, and Amusements.
13. The Wyman Test of Intellectual, Social, and Activity Interests.

Further details in regard to these sources of data are set forth in the respective sections of this report which follow and need not be described here.

CHAPTER III

RACIAL AND SOCIAL ORIGIN

RACIAL ORIGIN

A questionnaire filled out by the parents, a part of which was in regard to the descent of the child, furnished the chief data on racial origin. This was sent to the parents of all the children weighed and measured and its returns were considered as to the possible racial contribution to the state of body-weight found in the three groups of children retained for the study. The per cent of each racial or nationality group appears for each of the three weight groups in Table I arranged in order of size for the over-weight column.

Certain items in Table I stand out as being probably significant. Of the total number of 30 racial stock represented, the English stock leads the list for the three groups which, no doubt, is the preponderant racial population group in this country. The next highest percentages are found in the German, German Jewish, Italian, and Russian Jewish stocks, all of which groups make up the bulk of the New York City public school population in the canvassed districts. The English, German Jewish, Italian, and Russian Jewish, considering their proportions in all three weight groups, furnish most of the over-weight group, while the German and Irish, with their proportions in the same weight groups, furnish the greatest number to the under-weight group, the German stock furnishing 6.7 per cent and the Irish 6.3 per cent more than to their next highest numbers found in the normal-weight column. One might conclude from these data, although they are limited and the differences are comparatively small (though there are sufficient data in the literature [25, 35] on the influence of race on physical traits to support the conclusion), that because an individual is of certain remote ancestry or race the probability is great that he will approximate the general trend of body-weight peculiar to that racial stock for reasons governing the laws of heredity.

TABLE I

Racial Origin

(Per cent of grandparents of each racial or nationality group)

Racial Stock	Over-weight		Normal-weight		Under-weight	
	Paternal	Maternal	Paternal	Maternal	Paternal	Maternal
English	25.0	32.8	14.4	22.1	25.0	30.8
German Jewish	14.4	15.4	9.6	8.7	8.7	6.7
German	15.4	12.5	21.2	12.5	19.2	21.2
Italian	12.5	12.5	11.5	10.6	5.8	5.8
Russian Jewish	12.5	4.8	13.5	12.5	4.8	1.9
Polish Jewish	3.8	2.9	2.9	5.8	0.9	0.9
Irish	2.9	1.9	6.7	9.6	14.4	14.4
Roumanian	2.9	----	1.9	1.9	0.9	0.9
Austrian	1.9	1.9	2.9	0.9	1.9	0.9
Russian	1.9	0.9	0.9	0.9	----	----
French	0.9	1.9	0.9	1.9	----	----
Scotch	0.9	0.9	3.8	0.9	3.8	3.8
Greek	0.9	0.9	2.9	2.9	----	----
Swiss	0.9	0.9	0.9	3.8	0.9	0.9
Spanish	0.9	0.9	0.9	----	0.9	0.9
Swedish	0.9	0.9	----	----	0.9	----
Cuban	0.9	0.9	----	----	----	----
South American	----	0.9	----	----	1.9	1.9
Austrian Jewish	----	0.9	----	----	----	----
Porto Rican	----	----	1.9	1.9	----	----
Hungarian	----	----	0.9	0.9	1.9	2.9
Finnish	----	----	0.9	0.9	----	----
French Jewish	----	----	0.9	0.9	----	----
Norwegian	----	----	----	----	0.9	2.9
Danish	----	----	----	----	1.9	----
Slavonic	----	----	----	----	0.9	0.9
Dutch	----	----	----	----	0.9	0.9
Portuguese	----	----	----	----	0.9	----
Bohemian	----	----	----	----	0.9	----
Roumanian Jewish	----	----	----	----	0.9	----

In regard to the absence of negroes, Chinese, and Japanese, it should be stated that the study was confined to white children for no other reason than one of diet differences which the literature [28, 86, 103] shows to exist and which were obvious in the weighing of children for nomination to the three weight groups of this study. A sufficient number of children of these races to balance for the three weight groups could not be found in the same schools which was necessary for the purpose of ruling out any racial differences that might have existed by way of opportunity.

INFLUENCE OF IMMEDIATE FAMILY INHERITANCE ON WEIGHT

In the same questionnaire to parents, a form blank was provided to allow the checking by all available relatives in the over-weight, normal-weight, and under-weight columns of the approximate estimate of the general weight maintained by each of the child's relatives throughout the major years of their lives beginning with the child's siblings and numbers of each and extending to the paternal and maternal grandparents with their siblings.

The blank was filled out by about 80 per cent, but the data on the more remote relatives are less complete and less accurate than for the nearer ones. The data are given in Table II in total per cents for each body-weight group.

The summary in Table II is perhaps filled with all the errors of any subjective report based upon recall even though it was made by compiling the many judgments of all available relatives.

TABLE II

INFLUENCE OF IMMEDIATE FAMILY INHERITANCE ON WEIGHT

(Given in percentages with O meaning Over-weight, N, meaning Normal-weight, and U, meaning Under-weight)

Relatives	Over-weight						Normal-weight						Under-weight					
	Boys			Girls			Boys			Girls			Boys			Girls		
	O	N	U	O	N	U	O	N	U	O	N	U	O	N	U	O	N	U
Child's																		
Brother........	24	76	--	12	76	12	--	100	--	9	86	5	--	93	7	--	100	--
Sisters........	31	63	6	6	71	23	--	100	--	21	79		10	85	5	--	85	15
Child's																		
Father........	27	70	3	37	60	3	35	65	--	20	80		60	30	10	5	80	15
Mother........	43	53	4	40	54	6	22	78	--	16	84		13	83	4	5	70	25
Paternal																		
Uncles........	19	77	4	20	74	6	15	85	--	8	92		5	90	5	16	76	8
Aunts.........	27	73	--	35	65	--	24	76	--	17	3		6	88	6	5	95	0
Maternal																		
Uncles........	23	73	4	21	76	3	20	75	5	15	85		9	86	5	3	90	7
Aunts.........	26	70	4	34	66	--	35	60	5	4	96		--	100	--	8	89	3
Paternal																		
Grandfather...	16	76	8	27	65	8	11	89	--	20	80		--	93	7	--	93	7
Brothers of....	20	75	5	20	76	4	13	87	--	12	88		11	89	--	8	84	8
Sisters of......	10	85	5	25	71	4	8	92	--	9	91		--	100	--	--	100	--

TABLE II (*Continued*)

Relatives	Over-weight						Normal-weight						Under-weight					
	Boys			Girls			Boys			Girls			Boys			Girls		
	O	N	U	O	N	U	O	N	U	O	N	U	O	N	U	O	N	U
Maternal																		
Grandfather...	25	75	--	18	71	11	18	82	--	5	95		4	89	7	--	85	15
Brothers of....	16	84	--	18	78	4	25	75	--	5	95		8	84	8	--	100	--
Sisters of......	11	83	6	15	77	8	12	88	--	5	95		--	93	7	7	80	13
Paternal																		
Grandmother..	50	50	--	11	78	11	26	74	--	--	100		7	86	7	12	69	19
Brothers of....	38	62	--	7	80	13	7	93	--	6	94		--	100	--	--	100	--
Sisters of......	36	64	--	7	86	7	13	80	7	7	93		--	84	16	--	79	21
Maternal																		
Grandmother..	33	67	--	11	78	11	21	79	--	--	100		23	77	--	42	51	7
Brothers of....	8	92	--	--	94	6	20	80	--	6	94		22	56	22	12	88	--
Sisters of......	16	84	--	7	86	7	15	85	--	--	100		14	86	--	19	81	--
Total........	449	1502	49	371	1482	147	340	1643	17	185	1810	5	192	1692	116	142	1695	163

SUMMARY

	Mean per cent of Over-weight Relatives	Mean per cent of Normal-weight Relatives	Mean per cent of Under-weight Relatives
Over-weight Boys................	22.4	75.1	2.4
Over-weight Girls................	18.5	74.1	7.3
Normal-weight Boys..............	17.0	82.1	0.8
Normal-weight Girls..............	9.2	90.5	0.2
Under-weight Boys................	9.6	80.1	10.3
Under-weight Girls................	7.1	84.7	8.2

However, it does present a comparatively consistent picture of differences: all three groups have a major number of normal weight relatives; the over-weight group has the greatest percentage of over-weight relatives (20.4); while the normal-weight group follows with the next highest percentage of over-weight relatives (13.1). The under-weight group has 9.3 of under-weight relatives with few over-weight relatives as compared to the other two groups; while the other two groups have but few under-weight relatives. It might be said, in so far as these data go, likeness of individuals of like ancestry in body-weight is comparatively great, subtracting, of course, a proper allowance for their probable likeness in life habits.

BIRTHPLACES OF INDIVIDUALS

The birthplaces of the 312 children, obtained from the same source, are given in percentages in Table III, the percentages being arranged to show the frequency of native born and foreign born for the three weight groups.

TABLE III

BIRTHPLACES OF CHILDREN

(Given in percentages)

Country or State	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
United States*	96	86	90	98	92	89
England		2		2	2	
Germany		6	2			2
Russia			2			
Italy	2	2	2			
Austria		2				
Denmark						2
Finland			2			
South America	2				6	
Canada						4
Cuba		2				
Porto Rico			2			
Czechoslovakia						2
* New York City	76.9%		67.3%		67.3%	

There is little of significance in Table III, except that the three weight groups are well balanced as to frequency of births in the United States. The normal-weight group and the under-weight group have the same proportion of numbers born in New York City, while the over-weight group has but 9.6 per cent more, thus probably indicating that the majority of children used in this study have about the same general environmental background.

OCCUPATIONS OF FATHERS

The father's present occupation was reported in the same questionnaire return by all except those families where the father was deceased, as shown in the totals of Table IV.

TABLE IV

Occupations of Fathers

(In percentages according to the U. S. Census Classification)

Group	Over-weight	Normal-weight	Under-weight
Professional Group			
Lawyers	1	2	0
Engineers (with college degrees)	0	1	0
Physicians or Surgeons	1	3	1
Clergymen (Rabbi)	1	0	0
Dentists	1	0	1
Musicians	1	2	0
Total Professional	5	8	2
Proportion of all fathers	5.4	10.1	2.4
Commercial Group			
Executives and Managers	0	1	0
Salesmen and Insurance Agents	9	8	6
Retail Dealers	20	19	9
Clerical Workers	1	0	1
Wholesale Dealers, Brokers and Owners	5	2	4
Manufacturers	9	4	5
Druggists	1	1	0
Expert Accountants	1	0	0
Secretaries	0	0	1
Real Estate Operators	2	2	2
Hotel Owners	1	0	0
Theatre Owners	1	1	0
Motion Picture Producers	1	0	0
Importers	0	0	1
Book-keepers	1	0	0
Total Commercial	52	38	29
Proportion of all fathers	56.6	48.1	34.5
Industrial Group			
Carpenters	1	2	1
Mechanics and Machinists	5	5	3
Tailors	0	0	4
Painters	1	1	4
Contractors	1	0	1
Barbers	5	3	1
Butchers	2	2	0
Garage Owners	1	0	0
Farmers	2	0	0
Lithographers	0	1	2
Laundry Owners	2	0	1
Foremen	1	1	1
Seamen	0	1	2
Bakers	2	1	2
Cobblers	1	3	1
Tinners	1	0	0
Paper-hangers	0	0	1
Plasterers	0	0	1
Electricians	0	0	1
Iron-workers	0	0	1

The reported occupations were classified, in so far as it was possible, according to the form of the U. S. Census Classification Method.

TABLE IV (*Continued*)

Group	Over-weight	Normal-weight	Under-weight
Practically unskilled:			
Chauffeurs	0	3	10
Apartment Superintendents and Janitors	4	1	6
Motormen	0	1	1
Waiters	0	3	4
Window-cleaners	1	0	0
Shoe-shiners	0	0	0
Milk-men	0	0	1
Teamsters	0	1	2
Ice-men	1	1	0
Elevator-men	0	1	0
Factory-workers	1	0	0
Watchmen	1	0	0
Laborers	0	1	0
Total Industrial	33	32	52
Proportion of all fathers	35.9	40.5	61.9
PUBLIC SERVICE GROUP			
City Firemen	1	1	0
Detectives	1	0	0
Attendance Officers	0	0	1
Total Public Service	2	1	1
Proportion of all fathers	2.1	1.3	1.2
SUMMARY	*Total Per Cent*	*Total Per Cent*	*Total Per Cent*
Professional Group	5.4	10.1	2.4
Commercial Group	56.6	48.1	34.5
Industrial Group	35.9	40.5	61.9
Public Service Group	2.1	1.3	1.2

The summary in Table IV shows a very small percentage of parents of all three groups engaged in the professional pursuits and in public service occupations, with the normal-weight group slightly favored by the former and the over-weight group by the latter. The commercial occupations show the over-weight group dominating in frequency of numbers by 8.5 per cent more than the normal-weight group and 22.1 per cent more than the underweight group, and this may, to some degree, imply the probability of better social position in this group in so far as it can be purchased. The industrial group of occupations with their limited incomes is shown to have the greatest number in the underweight group, exceeding the normal-weight frequency by 21.4 per cent and the over-weight group by 26.0 per cent; the fact of suggested money limitation in industrial occupation incomes suggests the limits of the social status of this group.

SUMMARY

1. Data on racial origin indicated that all three groups were made up principally of English, German, German Jewish, Italian, and Russian Jewish stocks; there was an excess of English, German Jewish, Italian, and Russian Jewish in the over-weight group, and of German and Irish in the under-weight group.

2. Approximately 90 per cent of the children were native born. About two thirds of all children were born in New York City, thus indicating that nearly all have had the same general environmental background.

3. The inheritance of a tendency to maintain a certain body-weight was shown in Table II; the over-weight and under-weight groups as well as the normal-weight group had most of their relatives of normal weight, while the over-weight group had the greatest percentage of over-weight relatives and the under-weight group of under-weight relatives.

4. Classification of the occupations of fathers gave the Commercial Group the greatest number among the over-weight group while the Industrial Group had the greatest number among the under-weight, which suggested probable social opportunity differences where financial incomes are of such disparate extremes. The Professional Group and the Public Service Group had the fewest numbers, with the normal-weight group leading in the former and the over-weight group in the latter.

CHAPTER IV

SOME ANTHROPOMETRICAL MEASUREMENTS AND TESTS OF PHYSICAL AND MOTOR CAPACITY

The purpose of this part of the study was to determine, through a series of selected physical measurements, the size, weight, and strength of the human body in the three groups of subjects studied.

The data were collected in two parts since they were derived under two entirely different anthropometrical laboratory conditions and for two different numbers of subjects. The measurements for all children done in the schools include: the taking of standing height according to a standard procedure; the taking of weight in English units for all, but on scales available in each school, thus introducing an error, even though a standardized procedure was followed, since the correctness of all scales was not known; finally, the taking of strength of grip on the improved form of Smedley's dynamometer according to standard procedure. The measurements of the volunteers for the nutrition study were done under correct conditions; these children had in addition to the above: weight taken on tested anthropometric scales; standing height and sitting height on a standard stadiometer according to a standard method; a basal metabolism test; and three tests of physical and motor capacity, namely, vital capacity, speed of movement, and steadiness of muscular control. Most of the measurement data on the volunteers for the nutrition study, though they have anthropometrical considerations, will be reported in Chapter VI since they are more pertinent there. Only the data on the three tests of physical and motor capacity done on the volunteer group will be reported in this chapter.

HEIGHT AND WEIGHT

The summary of original data for all height and weight measurements made in the schools may be seen in Table V.

TABLE V

Summary of Height-Weight Measurements

Variables	Over-weight				Normal-weight				Under-weight			
	Boys		Girls		Boys		Girls		Boys		Girls	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Deviation (pounds)	+21.48	9.46	+20.44	8.24	+.68	2.17	+1.25	3.55	−10.81	3.21	−11.15	4.57
Weight-Height Coefficient Deviations	+43.19	17.80	+34.27	19.25	−.81	8.89	−2.58	15.54	−12.58	8.79	−23.88	12.18
Height (inches)	57.92	2.27	57.67	2.55	56.27	2.34	56.29	3.52	57.71	2.76	56.56	3.25
Weight (pounds)	106.08	10.97	104.77	15.00	78.69	8.65	81.46	14.28	72.92	8.96	69.38	9.76
Weight (per cent)	26.46	15.01	24.38	9.53	.96	2.84	.77	3.15	−12.77	3.14	−13.67	4.32
Calculated Nude Weight	101.52	11.21	102.25	14.85	75.15	7.83	79.46	14.12	69.50	8.33	67.96	9.55
Weight-Height Coefficient	1.76	.19	1.77	.19	1.33	.09	1.41	.17	1.21	.09	1.20	.11

The children were weighed without out-door clothing, shoes, coats and sweaters. Heights were taken with two squares consisting of two flat pieces of wood joined at right angles; the square was used with the child in good erect position with heels and shoulders against a wall upon which was marked an accurate measure. Age was taken to the nearest birthday.

For comparative reasons as shown later, two standards were used as norms for calculating two separate sets of deviations. The first standard used and the one by which all children were nominated to the three groups was the new Baldwin-Wood Height-Weight-Age Table for tall, medium, and short American children. This table follows the procedure indicated above in respect to the taking of height, weight, and age. According to this table a child is considered eleven years old at any time between 10½ and 11½ years; therefore the 11 and 12-year-old weight norms had to be used as the chronological age range selected for these subjects was 11 years through 11 years 11 months. In obtaining deviations in pounds some of the subjects were found to be too tall or too short; so norms were not available for their height, thus making it necessary in those cases to interpolate to secure norms for them in proportion to those for other heights. It was obvious throughout the use of the Baldwin-Wood Tables that many children who fulfilled the criterion of selection for the over-weight group (that of 15 per cent overweight and above for the norm) did not appear fat when observed but quite normal and in some cases almost thin. These children were of the so-called linear type with larger and probably heavier bones than the so-called lateral type; yet this variable of probable bone size and weight has not been considered a probable weight error in the determination of this or other weight standards, no doubt because of its intangibility. (The new Wood-Rowell chart of development, though weights are based on the Baldwin-Wood Table, takes care of body-weight increments each month and so considers the variable.) These children were kept, however, since the selection standard decided upon at the outset was that of certain deviations from the Baldwin-Wood norms.

Italian children have been found to deviate widely from other "national types" in that they tend to be shorter and stockier [43, 118]. It obviously leads to an absurdity to use the so-called standard tables since they do not fit their build which is heavier for each inch of height than the children used in standardizing the tables. It would have been much more fair in this study to have excluded them, or to have isolated them for a special study with the use of build-norms constructed for Italian children only. However, they were included and compared with the so-called standard norms which procedure is, perhaps, no more fallacious than to compare all other children to those same norms regardless of size and weight of bone conditions (which is a similar variable in the same problem, consideration of which is needed by all determining or using height-weight-age norms).

The second standard used for computing deviations was the Baldwin Measuring Scale for Physical Development. The norms of this scale were also used throughout (for the children measured in the schools) for comparative reasons since the Baldwin Measuring Scale differs from the Baldwin-Wood Table in that it takes care of extremes of height making it unneccessary to interpolate. The formula for the Baldwin Measuring Scale is: nude weight in pounds divided by height in inches equals the weight-height coefficient. Since none of the weights were nude weights, it was necessary to calculate nude weight for each child by following the Baldwin procedure [4]. The Baldwin-Measuring Scale weight-height coefficient deviations with the Baldwin-Wood deviations in pounds are represented graphically in Figures 1 and 2.

STANDING HEIGHT

The mean height for each sex group, according to Table V, shows the over-weight boys, the over-weight girls, and the under-weight boys to be approximately 57 inches tall with the standard deviation showing 68 per cent of the cases within two inches, plus or minus, of that height; the mean height for normal-weight boys and girls as well as for the under-weight girls is approximately 56 inches with 68 per cent of the cases showing a plus or minus deviation from 56 inches to the extent of about three inches for the girls in each group and about two inches for the normal-weight boys.

The mean height in inches for each total body-weight group along with the difference of the means and the probable error of the difference of the means is shown in Table VI.

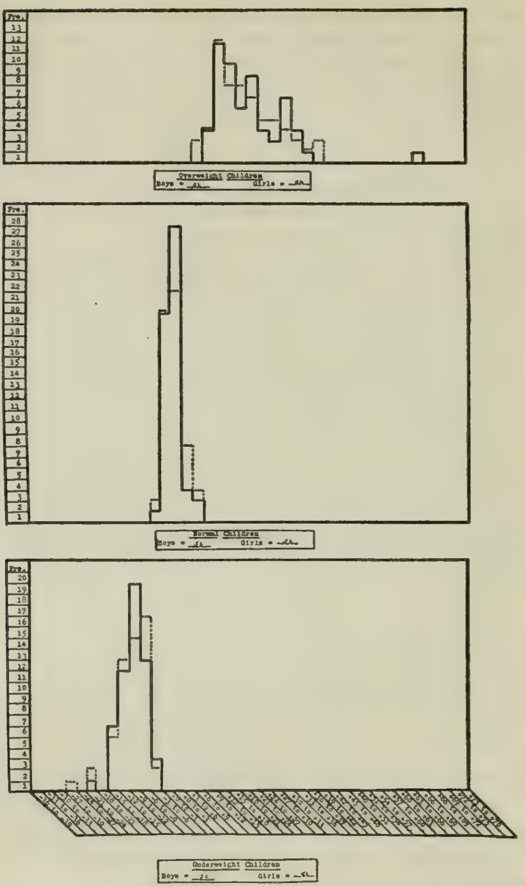

FIGURE 1. DEVIATIONS (IN POUNDS) FROM BALDWIN-WOOD NORMS

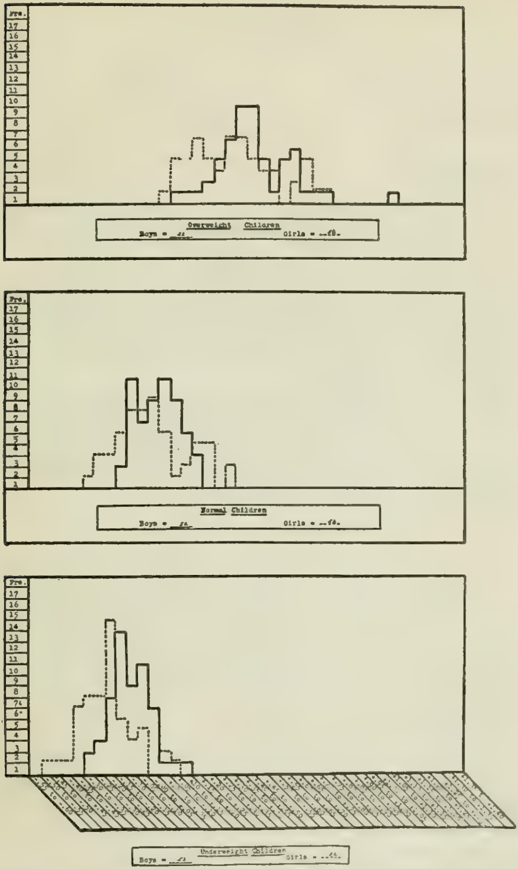

FIGURE 2. DEVIATIONS BASED ON BALDWIN WEIGHT-HEIGHT COEFFICIENTS.

TABLE VI

STANDING HEIGHT (INCHES)

Groups	Mean	S. D.	Diff. of M's	P.E.$_{dM}$
Under-weight Group	57.14	3.07	.86	.238
Normal-weight Group	56.28	2.99		
Normal-weight Group	56.28	2.94	1.52	.254
Over-weight Group	57.80	2.42		
Under-weight Group	57.14	3.07	.66	.259
Over-weight Group	57.80	2.42		

According to these data, the over-weight and under-weight groups are on the whole slightly taller than the normal-weight group, since the difference of the means in each case is at least three times the probable error of the difference of the means. The greatest difference in height seems to exist between the over-weight and normal-weight groups where the difference of the means is almost six times the probable error indicating the over-weight group to be taller.

However, it might be said, in concluding, that height in inches for all body-weight groups is quite concentrated as shown by the means and standard deviations, thus indicating that if all three groups were considered as superimposed or as one the height curve would resemble a normal frequency curve.

WEIGHT

From Table V and from Figures 1 and 2 two outstanding differences are noted when the use of the Baldwin-Wood Table is compared with that of the Baldwin Measuring Scale: first, there is considerably more overlapping of the three body-weight groups when the weight-height coefficients are used; second, the over-weight group has more extreme cases of weight than the under-weight group, which is more obviously noted in the use of the Baldwin-Wood pound deviations.

The mean and standard deviation of the per cents of pound deviation in each group is interesting as a check on the original criterion of selection for each group, since deviations from the selection criterion had to be made in each case in order to secure balanced numbers in the three body-weight groups within each school for the purpose of equalizing educational opportunity. The summary which follows, Table VII, shows the original selection criterion for each group and how it actually worked out when deviations from it had to be met for the above reason.

TABLE VII

Per Cent of Weight Deviations

(Summary of Per Cent of Weight Deviations from Table V)

	Original Selection Standard	Mean	S.D.	Range (for the 68% around average)
Over-weight Boys..........	15%+	26.46	15.01	+ 9.45 – +39.47
Over-weight Girls..........		24.38	9.53	+14.85 – +33.91
Normal-weight Boys.......:	5%±	.96	2.84	– 1.88 – + 3.80
Normal-weight Girls........		.77	3.15	– 2.38 – + 3.92
Under-weight Boys.........		–12.77	3.14	– 9.63 – –15.91
Under-weight Girls.........	8%–	–13.67	4.32	– 9.35 – –17.99

The summary in Table VII shows, considering only the standard deviation with its 68 per cent range, that the over-weight selection standard had to be lowered for the over-weight-boy group in order to secure the same number of children for each sex and body-weight group from each school. The normal-weight group range for both boys and girls indicates the ease with which numbers could be balanced for this group. The under-weight group fulfilled the criterion of selection, but the extreme limit of the range of this group is only about one-half that of the over-weight group, indicating that there were fewer extremely thin children than there were extremely fat children from whom to select.

SOME MEASUREMENTS OF THE VOLUNTEER GROUPS

All the over-weight and normal-weight children as previously indicated were sought for the nutrition study, but the under-weight children were excluded from that study for the reason that there are some reliable data available for them since they have been of research concern for some time [86, 92, 100, 103, 121]. The entire 208 children in the over-weight and normal-weight groups were difficult to secure because of indifference, parental objection, and the like; but 117 volunteered, which is considered a goodly number for such a study. Three tests of physical and motor capacity were given which differ in a way from anthropometric measures in that they measure not mere size and dimension but functional, especially muscular, capacity. These three test results follow for the volunteer group along with another of almost the same kind which was given to all children.

STRENGTH OF GRIP

The Strength of Grip Test was used to secure an index of general bodily strength in so far as it is measured by Smedley's improved dynamometer. The method as found in Whipple's Manual was followed throughout. This test was given to all (312) children of these groups in the school, the results in terms of means and standard deviations follow for the sexes and the groups as a whole:

TABLE VIII

STRENGTH OF GRIP (POUNDS)

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
Right Hand						
Mean.....	53.74	47.63	50.74	44.85	48.96	40.84
S. D......	7.71	9.02	6.23	9.31	7.73	6.41
Left Hand						
Mean.....	50.36	44.22	46.85	40.85	43.46	38.39
S. D......	7.84	7.92	5.98	8.43	7.06	6.04
	Under-weight	Normal-weight:	Normal-weight	Over-weight:	Under-weight	Over-weight
Right Hand						
Mean.....	45.02	47.79	47.79	50.66	45.02	50.66
S. D......	8.20	8.45	8.45	8.94	8.20	8.94
Diff. of *M*'s	2.77		2.87		5.64	
P. E. *dM* ..	.781		.804		.802	
Left Hand						
Mean.....	41.00	43.85	43.85	47.26	41.00	47.26
S. D......	7.05	7.90	7.90	8.46	7.05	8.46
Diff. of *M*'s	2.85		3.41		6.26	
P. E. *dM* ..	.701		.756		.727	

The above results indicate the following: First, the over-weight group is superior to the normal-weight group in the strength of grip of both hands (the left hand being relatively stronger among the over-weight) as the difference of the means for each hand is slightly more than three times the probable error of the difference of the means; the over-weight group is even more superior to the under-weight group as the difference of the means is more than seven times the probable error for the right hand and more than eight times for the left hand. Second, sex differences are noted in the strength of the right hand grip in favor of all the boy groups, but in the left hand an exception occurs where the over-weight girls surpass the under-weight boys. This test, however, is easily conditioned by incentives in competition, personal encouragement, and a maximal effort.

VITAL CAPACITY

Vital capacity is considered an important index of general physical condition and capacity. The ratio of vital capacity to weight suggests the balance between bodily size and the rate and completeness with which oxidation takes place. A high vital capacity in relation to weight is considered a preventive of auto-intoxication, gives increased resistance to disease, and is the foundation of endurance under effort.

The procedure used was that of Dreyer [32], which gives the individual credit for the highest of five trials in expiring a maximal volume of air after taking a maximal inspiration. The results appear in Table IX for the volunteer nutrition study groups, while the original scores are included in Chapter VI.

TABLE IX

VITAL CAPACITY

(Expressed by Means and Standard Deviations of Liters)

Subjects	Mean Weight (Pounds)	Mean V.C. (Liters)	V.C. S.D. (Liters)	V.C. Norm (Liters)	Deviation from Norm (Liters)
Over-weight Boys	106.53	2.47	.326	3.13	−0.66
Over-weight Girls	92.52	2.17	.373	2.45	−0.28
Normal-weight Boys	79.44	2.29	.390	2.49	−0.20
Normal-weight Girls	82.60	2.03	.418	2.25	−0.22

The deviations in liters from the norms seem small, but when the equivalents in cubic centimeters are considered the deviations are more significant. The mean deviation for the over-weight group is –.47 liters as compared with –.16 liters for the normal-weight group; in other words, the over-weight group deviates –470 cc. from the norm or –310 cc. more than the normal-weight group. Both groups, however, are below the norms set for their weights. The results in terms of cc. deviations are consistent with previous findings in that weight reduction has been found to increase breathing capacity [58, 91].

QUICKNESS OF RATE OF MOVEMENT

The Tapping Test was used in an attempt to secure an index of voluntary motor ability. The method used was that found in Whipple's Manual for the Stoelting Tapping Board, but instead of a kymograph an electric clock was used and a duration of 30 seconds was permitted for one trial with each hand. The results appear in Table X for the volunteer nutrition study group.

TABLE X

RATE OF MOVEMENT

(Means and Standard Deviations)

Subjects	Total Number of Taps		Subjects	Total Number of Taps	
	Right Hand	Left Hand		Right Hand	Left Hand
Over-weight Boys			Normal-weight Boys		
Mean	162.47	132.17	Mean	161.70	135.76
S.D.	19.33	16.11	S.D.	20.28	19.44
Over-weight Girls			Normal-weight Girls		
Mean	160.89	135.40	Mean	156.81	133.31
S.D.	19.79	20.70	S.D.	12.44	14.33

According to the results in Table X, the over-weight boys and girls slightly exceed the right hand records of the normal-weight boys and girls. The over-weight boys and the normal-weight boys are close rivals for the highest right hand record, while the normal-weight boys and the over-weight girls are so for the highest left hand record. However, the differences between the over-weight and normal-weight groups, regardless of sex, are small. The difference of the means of these two groups for the right hand is 2.87 with a probable error difference of the mean of 2.27, while the difference of the means for the left hand is 1.69 with a probable error of 2.23. In neither instance is the difference of the means at least three times the probable error. The results show that body-weight has little, or nothing, to do with speed of movement.

STEADINESS IN MOTOR CONTROL

The purpose of the Steadiness Test is to measure the amount of involuntary movement which appears when the body as a whole is held as nearly motionless as possible. The technique of procedure is that in Whipple's Manual for the Stoelting Steadiness Test, but an electric clock was used instead of a kymograph and 15 seconds allowed for each trial with each hand. The results appear by showing the number of contacts made in that hole which most satisfactorily tested the steadiness of these subjects, namely, the seventh. The results, however, must be considered with qualifications and without placing much insistence on their worth as the involuntary movement frequencies are so easily affected by such things as direction of attention, the relative position of the body and instrument, and the respiration rate. Table XI gives the number of contacts made in the seventh hole with each hand.

TABLE XI

STEADINESS IN MOTOR CONTROL

(Means and Standard Deviations)

Subjects	Number of Contacts		Subjects	Number of Contacts	
	Right Hand	Left Hand		Right Hand	Left Hand
Over-weight Boys			Normal-weight Boys		
Mean	29.37	34.00	Mean	23.94	29.82
S.D.	12.55	12.61	S.D.	12.87	17.04
Over-weight Girls			Normal-weight Girls		
Mean	18.14	25.22	Mean	21.88	28.29
S.D.	13.00	13.46	S.D.	7.69	9.93

According to the above results, the fewest contacts, consequently the best record, is that of the over-weight girls for both hands. The normal-weight boys are next best while the normal-weight girls have the worst record. When the total groups are considered, regardless of sex, the difference of the means for the right hand is 3.48 in favor of the over-weight group with a probable error of 1.53; but the difference of the means for the left hand is 0.5 with a probable error of 1.72. The difference of the means for the left hand is negligible, but the difference of the means for the right hand is significant when measured by its probable error, indicating that the over-weight children are slightly more steady in motor control than the normal-weight children.

SUMMARY

1. The use of the Baldwin-Wood Weight-Height-Age Tables and the Baldwin Measuring Scale indicated more overlapping when the original pound deviations of selection, on the basis of the Baldwin-Wood norms, were converted into weight-height coefficient deviations.

2. Children selected for the over-weight group on the basis of 15 per cent over the norm for their height and age were found on observation to appear normal-weight or thin if they were of the so-called linear type. This suggested that the body-weight standards used did not measure fatness and leanness.

3. The differences in height as expressed by the differences of the means and the probable error of the differences of the means indicated the over-weight and under-weight groups were about the same height, the greatest difference in height was 1.52 inches (with a P. E.$_{dM}$ of .254) when the over-weight and normal-weight groups were compared, which showed the over-weight group was taller.

4. The Strength of Grip Test revealed the over-weight group was the most superior with both hands when compared to the normal-weight and the under-weight groups as the differences of the means as measured by the probable error of the difference of the means were significant. The under-weight group was the weakest of all three groups in both hands.

5. The over-weight group deviated in vital capacity –470 cc. from the norm for their mean weight or –310 cc. more than did the normal-weight group. Both groups were below the vital capacity norms for their mean weights. The results are consistent with previous findings in that weight reduction increases breathing capacity.

6. The results of the Rate of Movement Test showed insignificant differences when the over-weight and normal-weight groups were compared, indicating that body-weight has little, or nothing, to do with speed of movement.

7. The over-weight children were slightly more steady than the normal-weight groups in the motor control of the right hand as found when the difference of the means was measured by the probable error of the difference of the means. The difference between the groups in left hand achievement was negligible.

CHAPTER V

PHYSICAL AND HEALTH HISTORY

The data for this part of the study came from two sources: (1) the records of the physician who gave the medical examinations to the children of the Horace Mann School and from like records kept by examiners selected and trained for this part of the work by Dr. Hugh Rowell, Medical Examiner for the Horace Mann School and Lecturer in Columbia University, from among his graduate students in his course on "Health Examinations and Anthropometry"; (2) another blank similar to the new Wood-Rowell blank was filled out, giving such information as the history of certain childish diseases and the like.

Each of the above sources has its inaccuracies. The medical history recorded by the physician is, of course, the more reliable procedure of the first source mentioned, and would have been desirable for all the children if it had been feasible. The second source was subject to the usual errors of report as are similar sources in this study.

WEIGHT HISTORY

Exclusive of the prematurely born and those who did not reply to the request for the weight history data, the results in Table XII, expressed as means in pounds and years of age, represent about 70 per cent only of the total number of subjects.

It would seem from Table XII that weight at birth is not, as far as these data go, an index to later weight where groups are concerned, no matter how indicative it may be in individual cases. The over-weight boy subject group leads in the number of pounds over-weight at birth and is almost reached by the under-weight boy subject group; all the other groups approximate normal and in a plus direction. There are several theories that might be brought to bear in interpreting the data: some say [3, 47], granting extremes, that the major number of children at birth are slightly over-nutritioned, as indicated by their weights, but that these weights are soon lost in difficult feeding and in

TABLE XII

Weight History

(In Terms of Means)

	Weight at Birth (Pounds)	Composite Norms of Faber, Holt, Hollingworth, and Bowditch of Weight at Birth (Pounds)	Deviations (Pounds)	Age of Onset of Present Body-weight
Over-weight Boys	9.59	7.54	+2.05	7.17
Over-weight Girls	7.42	7.20	+0.22	6.17
Normal-weight Boys	7.80	7.54	+0.26	4.75
Normal-weight Girls	7.74	7.20	+0.54	4.09
Under-weight Boys	8.86	7.54	+1.32	4.13
Under-weight Girls	7.71	7.20	+0.51	3.26

combating infectious diseases; others say [2, 30, 47] that even the slightest amount of over-weight at birth should be considered seriously as probably indicating a hypo-functon of the glandular activity controlling metabolism which, if it persists, leads on to a more difficult adipose condition if not corrected. However, the most that can be said by way of interpretation for this table, considering particularly the third and fourth columns, is that the data show the onset of weight extremes to begin at about four years of age for the major number in the under-weight group and at about seven years of age for the major number in the over-weight group, regardless of the weight interim from birth until then. This fact seemingly indicates that some factor peculiar or common to each group is operating in the one case to continue the adipose condition and in the other to change it to the other extreme, or, which is more likely, that the one group is slightly over-weight at birth because it is over-nourished.

LOCALIZATION OF ADIPOSITY

The distribution of fat [37, 50] in the case of the over-weight children was a consideration in order to see how many of these children presented a localization of fat pads as against some other type of distribution. The distributions are indicated in percentages in Table XIII.

TABLE XIII

Localization of Adiposity

(Percentages)

	Marked Girdle Obesity	Even Distribution of Adiposity	Other Distributions of Adiposity
Over-weight Boys	32	14	54
Over-weight Girls	38	16	45

The above percentages, except for the private school over-weight groups, are dependent entirely upon the observation of localization of adiposity in so far as it could be judged with only the out-door clothing, coats, shoes, and sweaters removed. However, all three columns of percentages are consistent in approximating the results of other studies.

The caption "Other Distributions of Adiposity" includes those cases where the distribution assumed no particular uniform localization, which is often the result when one of the causes of exogenous obesity has been too rapidly experienced by the individual. The extent of the worth of these percentages, which are the largest in the three columns, may be seen in Chapter VI by comparing these with the tentative percentages of those in which the prediction figures show the probability of adiposity being caused in these cases by an over-calory consumption.

The second column contains comparatively small percentages of those whose adiposity may be of a thyroid deficiency origin. Children who have their adiposity evenly distributed, even the ankles and wrists seeming to be generously covered, are considered of such classical design as to be known as suffering from Infantile Adiposity. The onset is usually very early in these cases and the numbers many; but because of the close inter-action among endocrine glands this number is soon reduced, if the thyroid disturbance has been great, by another gland dysfunction which superimposes its picture to the extent that the first is scarcely recognizable.

The first column presents the percentages of those who were of the classical Juvenile Adiposity class, that is, those who had most of their fat centered about the girdle. This condition may occur anywhere from four to fourteen years of age as an original condition or as one associated with a thyroid dysfunction, present-

TABLE XIV

Timme's Classification of Abnormal Sella Turcica with Attendant Syndromes

(Copied with the author's permission from pages 90–91 of "Lectures on Endocrinology")

CLASSIFICATION OF ABNORMAL SELLA TURCICA WITH ATTENDANT SYNDROMES

	Character of Sella Turcica.	*Salient Features of Symptomatology.*
Group "A"	With no demonstrable physical enlargement or diminution. Seemingly normal sella.	*Underactivity.* Usually undersized; maxillary prognathism; crowded teeth; adiposity; Froelich's dystrophy; low blood pressure; menstrual disturbances; diminished libido; diabetes insipidus. Somnolence; mentally dull and apathetic; lack of concentration High sugar tolerance. *Overactivity.* Frequent and severe headaches; rapid growth; moderate contraction of visual fields; sexual trends; high blood pressure. Great mental activity; initiative; irritability. Low sugar tolerance.
Group "B"	With demonstrable smallness of sella turcica and lack of cavity space for proper expansion of the gland.	Signs of congenital hypopituitarism; may or may not be headaches; Froelich's dystrophia adiposogenitalis; lack of proportionate skeletal build; fatigability; adiposity; usually small genitalia and perhaps reversion in type; sex abnormalities. *Mental Signs.* Compulsions; lack of inhibition; pathological liars; intellectual and moral inferiority; little initiative; epilepsy. High sugar tolerance. Frequent relative lymphocytosis.
Group "C"	Demonstrable original smallness of sella turcica with erosions, enlarging the cavity in any or all directions.	Pressure Signs. Long-continued and periodic headaches, occasionally migrainous with ophthalmoplegia — third nerve, fourth nerve, sixth nerve; unilateral temporal headache with lacrimation (nerve from ophthalmic division of fifth); epilepsy, with later uncinate fits. Metabolic Signs. Fatigability with headache and irregular menses and suprarenal deficiency. Secondary frequently to status thymicolymphaticus. Disturbances in growth; acromegaly; spacing of teeth; prognathism. Mental. Slow development; gradual self-adjustment; and cure. *If Erosion Anterior.* Bitemporal hemianopsia. *If Erosion Posterior.* Pyramidal tract lesions. *If Erosion Lateral.* Oculomotor disturbances; migraine.
Group "D"	Demonstrable in enlargement all cavity dimensions.	Pressure Signs. Headaches; bitemporal hemianopsia; oculomotor palsies; epilepsy; intracranial pressure; papilledema. Metabolic Signs. Acromegaly; giantism; disturbed sugar tolerance; etc.

ing in the former event certain clinical signs as localization of adiposity about the girdle which is peculiar to it or in the latter event superimposing these signs on a thyroid obesity picture of an even distribution of adiposity. Juvenile Obesity is thought to be caused by a dysfunction of the posterior lobe of the pituitary gland. This same dysfunction, though it may occur at four years of age, at eleven years of age may have an associated dysfunction in the anterior lobe of the pituitary gland, causing a bi-lobar condition known as Froelich's syndrome which is characterized by adiposis genitalis; this disease was found in every three out of five obese cases in the private school's medical records. It would have been interesting to have had an endocrine examination of the entire over-weight group to find the frequency of this kind of obesity.

Since endocrine obesity of pituitary origin was well marked in at least one third of all the observed over-weight groups, as far as the two chief clinical signs indicated, that is, age of onset and the type of fat localization, it was decided to show the associated clinical symptoms in order to better understand the difference between what the endogenous child suffers as compared with those of the exogenous obese type, who probably suffer only from digestive disturbances. Timme's classification is presented in Table XIV to show the clinical symptoms associated with abnormal conditions of the sella turcica which is the pituitary fossa of the sphenoid bone lodging the pituitary body.

ACCIDENTS AND OPERATIONS

All the replies to the inquiry as to number and kinds of accidents and operations are summarized in percentages, as shown in Table XV, for each group.

The data in Table XV indicate that boys are less cautious than girls as they have the greater number of accidents. Both the under-weight boys and girls have more accidents than children of other body-weights in proportion to their sexes, due, no doubt, to their physical condition which makes them less defensible in times of accident.

From the same table, it would seem that the over-weight children, as a group have had more operations than the other body-weight groups. There are probably several reasons for this frequency, perhaps susceptibility to illness or more available money

TABLE XV

ACCIDENTS SUFFERED

(Percentages of each general class of accidents)

Accidents	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
Broken bones, run-overs, and the like	16	9	16	12	19	14
Cuts, burns, scalds, etc.	18	7	17	7	20	8
Total	34	16	33	19	39	22

OPERATIONS SUFFERED

(Percentages of each type)

Operations	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
Adenoids	19	11	8	13	8	7
Tonsillectomy	27	17	18	19	18	22
Gland	0	0	0	3	0	5
Appendectomy	1	1	1	0	2	2
Mastoid	1	2	4	1	0	2
Miscellaneous	14	30	19	17	18	17
Total	62	61	50	53	46	55

especially for corrective purposes (as indicated by their fathers' occupations being largely commercial) make operations numerous in this group.

DISEASE HISTORY

A comparison of the frequency of diseases and symptoms suffered by all the children considered in this study is shown by numbers for the three weight groups in Table XVI.

The number of infectious diseases, as well as those described as miscellaneous, was greatest among the over-weight children. This is consistent with the history of operations, and with the histology of fat in that the anatomy of the tissue shows it to be fed chiefly by the heart and blood supply to the extent that those organs are not available when the time comes to combat illness.

TABLE XVI

DISEASE HISTORY

(Kinds of diseases and numbers of each)

INFECTIOUS DISEASES

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
Diphtheria	9	7	8	3	5	3
Scarlet Fever	11	10	8	12	11	4
Measles	38	36	27	37	34	30
Chicken-pox	26	32	26	31	21	31
Mumps	19	13	15	13	17	19
Whooping cough	29	25	25	28	23	24
Influenza	21	17	18	15	15	21
Total	153	140	127	139	126	132

MISCELLANEOUS DISEASES

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
Frequent Headaches	4	16	10	12	9	10
Frequent Colds	21	17	18	15	15	21
Hay Fever	3	2	2	1	1	2
St. Vitus Dance	0	2	2	0	1	0
Rheumatism	7	3	4	5	5	2
Chronic Constipation	2	11	8	7	4	9
Total	37	51	44	40	35	44

GENERAL WEAKNESS SYMPTOMS

Some general weakness symptoms in terms of percentages are listed in Table XVII on the basis of physical examination estimates as well as subjective feelings experienced by the children.

Seemingly, the under-weight groups when self estimated and when observed by others present the greatest number of children with general weakness symptoms. Feelings of fatigue are experienced by the over-weight group slightly more than by the other groups, perhaps because of the added burden of carrying about with them a fraction of another person, figuratively speaking. The under-weight group presents a large percentage of children with a general nervous condition (the estimation considered

TABLE XVII

General Weakness Symptoms

(Percentages of significant weaknesses)

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
General Condition Poor	0	4	0	6	2	4
Nervous Condition Poor	2	8	8	14	28	21
Appetite Poor	2	0	2	2	3	8
School Absence for "not feeling well"	10	18	15	18	27	46
Feelings of Constant Weakness	14	2	13	8	16	19
Feelings of Fatigue	21	18	16	16	17	15
Per Cent Positive	49	50	54	64	93	113

tremors, fidgets, pallor, and circles.) The largest percentage of school absence for no specific reason other than "not feeling well" is in the under-weight group.

POSTURE

Posture might have been considered under general symptoms of weakness, but since it was marked on a scale approximating the Harvard Posture Scale [119] it was thought more interesting for separate consideration. The ratings of posture were done on a scale ranging from 5 to 1, five being the rating for the best posture. The rating equivalents as well as percentages follow:

	5	4	3	2	1
	Good	Fairly good	Poor	Very Poor	Worst Possible
A.	Head straight above chest, hips, and feet.	Head too far forward.	Head forward	Head still more forward.	
B.	Chest up and forward.	Chest not so well up.	Chest flat	Chest flat and back.	
C.	Abdomen flat.	Abdomen but little changed.	Abdomen relaxed and forward.	Abdomen completely relaxed ("slouchy")	
D.	Back with curves unexaggerated	Back but little changed.	Back curves exaggerated.	Back curves exaggerated to the extreme.	

Few received the value of five or four for fulfilling the criteria of good posture. The under-weight group is highest in order of frequency of those receiving the rating 3, the normal-weight

TABLE XVIII

POSTURE

(Percentages of each group receiving a rating from 5 to 1, 5 being the highest)

	General Posture on Scale of Five					Flat Feet		Pronated Ankles
	Poorest 1	Very Poor 2	Poor 3	Fair 4	Good 5	Right	Left	
Over-weight Boys	15	95	20	0	0	22	23	37
Over-weight Girls	9	1[illegible]	22	[illegible]	2	18	20	33
Normal-weight Boys	2	68	30	0	0	25	25	36
Normal-weight Girls	4	65	27	2	2	20	17	35
Under-weight Boys	2	58	34	0	0	18	18	40
Under-weight Girls	2	54	38	6	0	23	22	0

group next with 2, and the over-weight group next with the rating of 1, which was given for the worst possible posture; but all groups approximate this with a composite mean for posture 2. However, 3, 2, and 1 are ratings for degrees of poor posture which fact suggests that all these children, regardless of degrees of body-weight, have poor posture habits, with the over-weight group showing the greatest tendency to "slump."

Practically one fifth of each group have flat feet, the normal-weight group has the greatest frequency while the over-weight group is second. This seemingly indicates that the size of body-weight has very little to do with the cause of flat feet and that probably shoes, poor posture, or some other factor may be the cause. About one third of each group have pronated ankles probable for the same reason that they have flat feet.

PULSE

Heart rate as judged by the number of pulse beats per minute follows in Table XIX for sex groups and for the total groups regardless of sex.

The means of the sex groups suggest that the girls in each group have a higher heart rate than the boys in each group, and that the under-weight boys and the under-weight girls have the highest rate for the sexes in all groups. The standard deviations indicate about the same variability in each group except for the normal-weight girls, where it is slightly smaller.

TABLE XIX

PULSE

(Number of heart beats per minute)

Sex Groups	Over-weight Group		Normal-weight Group		Under-weight Group	
	Boys	Girls	Boys	Girls	Boys	Girls
Mean	85.67	88.73	85.78	93.21	89.48	92.85
S.D.	10.89	11.37	10.88	9.70	11.02	11.26

Total Groups	Mean	S.D.	Diff. of M's	P.E.$_{dM}$
Under-weight Group	91.11	11.26	2.39	1.03
Normal-weight Group	88.72	10.72		
Normal-weight Group	88.72	10.72	1.52	1.02
Over-weight Group	87.20	11.24		
Under-weight Group	91.11	11.26	3.91	1.06
Over-weight Group	87.20	11.24		

When the total groups are considered, regardless of sex, the only significant difference occurs when the under-weight and over-weight means are compared. The under-weight group is shown to have a rapid pulse, thus indicating that oxidation occurs more rapidly with them.

HOURS OUT OF DOORS DAILY

Hours out of doors and hours spent indoors reading were considered to see if there would be any significant differences as to after school life as regards this rule of hygiene. The results in percentages appear in Table XX.

From the percentages it would seem that all boys and girls in these groups seem to spend more hours out of door in play than spent indoors reading, with the exception of the under-weight girls who seemingly are sheltered.

CONDITIONS OF HAIR, SKIN, AND NAILS

The characteristics considered in judging the condition of skin, hair, and nails appear in Table XXI, expressed in percentages.

The data showing hair, skin, and nail conditions indicative of

TABLE XX

HOURS OUT OF DOORS DAILY AND HOURS INDOORS READING

(Percentages of hours)

	Outdoor Play	Indoor Reading
Over-weight Boys	84	16
Over-weight Girls	66	34
Normal-weight Boys	82	18
Normal-weight Girls	73	25
Under-weight Boys	86	14
Under-weight Girls	20	26

TABLE XXI

HAIR, SKIN, AND NAIL CONDITIONS INDICATIVE OF DISTURBANCES

(Expressed in percentages)

	SKIN								
	Rough and Dry	Smooth and Soft	Colorful	Rash	Acne	Pimples	Boils	Hives	Eczema
Over-weight Boys	2		2	2	8				
Over-weight Girls						4			
Normal-weight Boys	2			2		2	2		
Normal-weight Girls	2	2	2	4	2				6
Under-weight Boys	2			10		4		2	
Under-weight Girls	2		2	11					

	HAIR					NAILS	
	Oily	Dry	Medium	Fine	Coarse	Bitten Nails	Brittle Nails
Over-weight Boys	8	75	4	37	43	36	6
Over-weight Girls	14	49	12	36	40	23	15
Normal-weight Boys	71	74	0	39	42	30	2
Normal-weight Girls	22	36	18	46	30	37	10
Under-weight Boys	12	65	8	55	18	44	2
Under-weight Girls	35	40	7	67	15	18	4

nutrition or glandular disturbances [37] show that: (1) there are few poor skin conditions among all the children, but a "rash" appears as the most significantly frequent one in the under-weight group, probably because of poor digestion, tonsils, or dentition; (2) the normal-weight group has the greatest number with oily hair, considering all body-weight groups, while the over-weight group has the greatest number with dry hair (the latter condition is sometimes associated with hypo-activity of the thyroid gland); (3) the girls have a greater frequency of brittle nails than the boys (the boys could not be so well judged in that their nails were short or bitten off; this is verified to an extent by the frequency in per cent of bitten nails revealed in Table XXI).

TEETH

Defective conditions found in dental diagnosis are used as important indicators of just which probable source contributors are at fault. The percentages of cases found to present certain dentition signs used in endocrine clinical diagnosis [117] are given in Table XXII.

According to the table, all weight groups have about the same

TABLE XXII

Teeth Conditions

(Percentages of Defective Conditions)

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
Tartar	11	14	0	0	0	4
Decayed	2	0	0	0	2	0
Yellow	2	0	0	0	0	0
Bluish	47	50	32	59	42	50
Soft	2	0	0	0	2	0
Large	4	0	6	0	2	7
Small	0	0	2	0	0	0
Large central incisors	11	8	16	10	16	17
Fang lacking in canines	2	0	0	2	0	0
Wedge shaped	0	0	0	2	0	0
Ridged	0	0	0	0	2	0
Irregular	11	14	2	20	6	22
Ragged edges	25	6	24	4	18	0
Wide spaces	23	14	18	0	24	20
Crowded	13	2	24	12	24	22

number of children presenting the teeth symptomatology of children who retain their thymus gland activity beyond twelve years of age (since these children are eleven years of age the major number of them should still have thymic activity though it should be waning). Such teeth are bluish white in color and are lacking in uniformity of size and development with some well marked cases showing large central incisors. In clinical pituitary obesity cases the teeth are malformed or irregularly spaced (either crowded or widely spaced teeth, depending upon the degree and character of the sella turcica defect). This table shows that about two fifths of all children have thymic subinvolution teeth, while approximately one fifth have teeth associated with a hypoactivity of the pituitary gland.

SEXUAL MATURITY

The frequency of sexual maturity in percentages appears in Table XXIII in so far as it was evidenced by mammary enlargement and the event of first menstruation in the girls and by the appearance of beard and voices changes in the boys [81].

Table XXIII shows the over-weight children mature sexually earlier than children of other body-weights. The normal-weight girls show an approach to early maturity; but it must be remembered that a few slightly over-weight girls had to be placed in the normal-weight group when that group was not large enough in a particular school to balance the numbers in the other groups and when the few over-weight children placed in the normal-weight group were the nearest approach to the normal-weight selection criterion.

TABLE XXIII

SEXUAL MATURITY

(Percentages)

	Boys		Girls	
	Appearance of Hair on Face	Voice Change	Mammary Enlargement	Menstruation
Over-weight	3	11	34	10
Normal-weight	0	0	26	9
Under-weight	0	0	16	0

SUMMARY

1. Seventy per cent of the children were one-half pound over-weight at birth regardless of present body-weight. The greatest excess of weight at birth occured for the over-weight and under-weight boys, which may indicate the operation of a peculiar or common factor to both that later causes the one to deviate to an opposite extreme.

2. The localization of adiposity in the case of the over-weight groups indicated: (1) a majority of cases with miscellaneous placements of fat, typical of over-nutritioned conditions of rapid progress; (2) around 15 per cent who had an equalized distribution typical of hypo-thyroid obesity; (3) finally, almost one third who presented marked girdle obesity typical of a posterior lobe deficiency of the hypophysis.

3. From data on percentages of operations and accidents, it would seem that the over-weight children had the greatest number of operations, perhaps because of great susceptibility to illnesses or because they had the most available money (as the occupations of fathers implied) for corrective operations as tonsillectomy.

4. The data on numbers of diseases suffered showed the over-weight children were less ready to combat illness, perhaps because of the nature of fat which according to its histology uses more than its share of blood supply all of which is needed in combatting diseases.

5. The under-weight children were reported to possess the greatest number of general weaknesses and nervous symptoms as fidgets, tremors, pallor, and circles.

6. Posture rated on a scale of 5 for fulfilling certain criteria showed all body-weight groups approximated a mean rating of 2, which is very poor posture, but the worst possible postures were found among the over-weight children.

Flat feet and pronated ankles were not any more frequent among the over-weight group than among the other body-weight groups showing, probably, that weight is not necessarily a contributing cause.

7. The under-weight group had the most rapid pulse, thus indicating a heart rate which allows great oxidation.

8. The percentages of hours spent out of doors playing as against the number spent indoors reading indicated that both

boys and girls of all groups played out of doors more than they read indoors with the exception of the under-weight girls who were seemingly sheltered.

9. Few poor skin conditions were found, except for the under-weight group which showed a frequency of "rash" indicative of probable digestive, dentition, or tonsil disturbances; the over-weight group had the highest percentage of dry hair which is associated with hypo-thyroid activity. The girls throughout showed the most brittle nails, but the boys could not be so well observed in this respect as they had nails which were extremely short or which had been bitten off (as shown in Table XXI).

10. About two fifths of all children presented the dental symptomatology of thymic subinvolution. About one fifth had teeth associated with a hypo-activity of the pituitary gland; namely, teeth which were malformed or irregularly spaced.

11. Considering such signs of sexual maturity as the appearance of beard and change of voice in the boys and mammary enlargement and the event of the first menstruation in the girls, the over-weight children were found the most mature of the three body-weight groups.

CHAPTER VI

RELATION OF BODY SIZE TO NUTRITIONAL STATUS

A group of phenomena whereby organic beings transform foodstuffs into complex tissue-elements (constructive metabolism, assimilation, anabolism) and convert complex substances into single ones in the producton of energy (destructive metabolism, dissimilation and katabolism) is known as metabolism or, stating it slightly differently, the process by which tissue is built up and waste repaired is known as nutrition.

Since nutritional status has been so closely associated with body size, it was only logical that it became an important part of this study. The data presented were those determined in the respiration laboratory of the nutrition department in a study of the basal energy requirement of the over-weight and normal-weight groups.

BASAL METABOLISM AND OBESITY

"In each mammal there is a basal metabolism." By the term "basal metabolism" or the "basal metabolic rate" of an organism is meant the minimal heat production of that organism. "When protein, fat, or carbohydrate is oxidized in the body, oxygen is consumed, carbon dioxide is given off, and heat is produced. These processes are principally affected in a given individual by the two factors, ingestion of food and muscular activity." [74]

All authorities agree that the metabolic rate depends largely upon thyroid activity since thyroid secretion is known to act as a catalyzer (pituitary secretion also but to a lesser degree) and that any increase in the activity of the gland raises the metabolic rate above normal while a decrease in the secretion depresses the rate below normal. The best measure of the degree of thyroid activity is the determination of the basal metabolic rate if diseases known to decrease or increase the basal metabolic rate (as febrile or associated conditions) are absent.

There are some cases of obesity, as previously indicated, which are due to disturbances of the internal secretions; and there are the other, and probably more common, cases of obesity due to life habits. (There are some authorities who give still another cause for obesity, namely, an unusually high efficiency of the organs directly concerned with fat metabolism.) These types of obesity can be differentiated by means of the basal metabolic rate determination, other things being equal. Evidently increased body bulk due to "inert fat" of the exogenous obese has not the same effect in reducing metabolism as the "inert fluid" in the endogenous obese; the basal metabolic rate in the former cases is usually within 10 per cent, above or below, of the so-called normal, while in the latter it is below minus 10 per cent.

PROCEDURE USED FOR BASAL METABOLISM DETERMINATIONS

The following represents a brief description of the technique followed which observed standard conditions for basal metabolism determinations and which is described in greater detail by MacLeod. [74]

The subjects were asked to come to the laboratory at 7.30 A. M. without having eaten anything since dinner the night before (which was 6.30 P. M. for the majority) which means that their bodies were in that state (since they had been fasting for 14 hours) in which they were doing none of the work which results from the ingestion of food, technically known as the post-absorptive state.

To secure the degree of muscular relaxation desired for the basal metabolism determination, the subjects were required to lie down and rest quietly for 20 to 30 minutes (depending upon the exertion made in getting to the laboratory) before observations were begun.

Body temperature sub-lingually was then taken. It is exceedingly necessary that body temperature be normal at the time of a basal metabolism determination, since each centigrade degree of increase above the individual's normal increases the basal metabolic rate about 13 per cent.

The two apparatus used were the Sanborn Benedict Portable Respiration Apparatus design of the closed circuit type and the method that of indirect calorimetry. While the subject was resting to recover from the muscular activity used in getting to the laboratory, motor and blower were oiled and the apparatus tested for tightness, after which sufficient oxygen was introduced to last somewhat longer than the duration of the test.

The subject was then fitted with the nose clip and the mouth piece was adjusted. Then the valve was turned, thus making the respiratory tract a part of the closed circuit. When the excursions of the bell indicated that normal and regular respiration was established, a scale reading at the end of an expiration was noted and at the same instant a stop watch started and the temperature read from a thermometer at the top of the bell. Duplicate observations were made by having a second observer take independent readings; minute readings were noted by observer number two while observer number one determined frequent pulse and respiration rates which were supplemented by as many as observer number two could make. After 10 to 12 minutes the scale reading was again noted at the end of a normal expiration, the watch stopped simultaneously, and the temperature of the bell again read. Mouth piece and nose clip were removed, the watches were read, and a fresh supply of oxygen was introduced into the apparatus while the subject lay quietly for a second period which was promptly begun. The barometer and the room temperature were read at the beginning and end of the two periods and the average taken.

After the second period the following measurements were taken by the observers with independent readings: (1) weight in kilograms according to the Baldwin-Wood procedure; (2) standing height and sitting height on a stadiometer graduated in tenths of a centimeter; and (3) vital capacity according to Dreyer's procedure on a vital capacity spirometer the scale of which was graduated in tenths of a liter.

COMPUTATION OF RESULTS

The computation of results was done in the order indicated by Figure 3 as described by MacLeod. Only one of the measures computed, however, will be reviewed here as it is by far the best measure of degrees of fatness and leanness and should have been used as the basis for the selection criteria of subjects for this study.

The body surface area was estimated from the DuBois surface area chart. The body surface area was determined by Dubois

Ht.= 143.7 (56.6) 73.5 Last food= Dinner 7:30 (Dec. 2, 1948) B.P.= x Name= Subject 33 (over-weight) (girl)

Wt.= 41.2 (90.6) Temp.= 98.4 V.C.= 1.91 1.91 1.97 2.14 2.10 Date= Dec 3, 1948

Area= 1.27 Age= 12 (April 28, 1936).

	Spir.R.	Spir.T.	Min.R.	Pulse	Resp.	Period
I	64.45 46.65 (1760)	24.2 (0.7) 24.9 (24.7)	60.8 58.7 56.1 54.9	90 88 90	12 14 14	9-11.6 (919)
II	62.50 44.60 (1780)	24.0 (1.0) 25.0 (24.5)	52.7 50.6 48.9 46.9	90 90 88	16 14 14	9-27.1 (946)
III	64.75 46.05 (1940)	24.9 (0.6) 25.5 (25.2)	62.1 60.2 58.2 56.2	80 82 82	14 12 14	10-2.9 (1005)
IV	64.25 44.60 (1950)	24.8 (0.6) 25.4 (25.1)	54.3 52.4 50.5 48.6 46.5	84 82 82	12 18 12	10-0.3 (1001)

Humidity

Bar.R.	Bar.T.
758.9 758.9	75.6 76.0
758.8 758.8	77.5 77.5

76.5

Av. Bar.R. = 758.9

B.S. Corr. = 3.0

Corr.Bar.R.= 755.9

	I	II	III	IV
Log temp. rise				
Log 37.4	.5729	.5729	.5729	.5729
Log A				
Antilog A	26	27	22	22
Spir.diff.,cc	1760	1780	1940	1950
Oxygen used	1786	1817	1962	1972
Log " "	2519	2593	2927	2949
Log, Table 7	9463	9468	9451	9453
Log B	1982	2061	2378	2402
Minus log time	9633	9754	0021	0004
Log C	2349	2307	2357	2398
Corr. oxygen/min.	171.7	170.1	172.1	173.7

Av.oxygen/min.	171.9
Cals./24 hrs., T.14	1194
Cals./hr.,T.14	49.8
Log cals./hr.	6972
Minus log area	1038
Log D	5934
Cals./sq.m./hr.	39.21

Av. cals./sq.m./hr.= 3921 A.and DuB.= Dev.= %

Av. cals./24 hrs.= 1194 H.and B.= Dev.= %

Dreyer= 1629 Dev.= -26.6 %

Norm. wt. for age= 81 Dev.= +11.8 %

Norm. wt. for 30= Dev.= %

Norm. V.C.= 2.4 Dev.= -10.2 %

Apparatus: Sanborn-Benedict Portable II.

Observers:

FIG. 3. OVER-WEIGHT GIRL WITH LOW METABOLIC RATE

RESULTS OF INDIVIDUAL DETERMINATIONS

Subject No	Date	Age Yrs -Mos	Sub-lingual Temp	Av Oxygen per Min Cc	Av Cals Sq M per Hr	Av Cals 24 Hrs	Dreyer Cals 24 Hrs Prediction	Dev from Dreyer % (Basal Metabolic Rate Used)	Dev in Cals Dreyer	Harris and Benedict Norms	Dev %	Dev in Cals from H and B	Benedict and Talbot Norm	Dev %	Dev in Cals	Wt Clothed but without Shoes		Norm Wt	Dev %	Dev Lbs	Standing Cms	Ht Ins	Sitting Ht Cms	Surf Area Sq M	V C Liters	Dreyer Norm Liters	Dev %	Dev Liters	Av Pulse	Av Resp	Von Pirquet Pelidisi
																Kgs	Lbs														
	OVER-WEIGHT BOYS																														
1	Nov 7, 25	11- 8	99 0	252 2	48 90	1752	1657	+ 5 7	+ 95	1494	+ 17 3	+ 258				54 9	120 8	90 0	+ 34 0	+ 30 8	150 8	59 4	79 7	1 49	2 80	3 42	- 16 0	- 53	84	17	102
2	Nov 7, '25	12- 0	98 6	263 4	51 66	1809	1565	+ 15 3	+ 244	1437	+ 25 9	+ 372				48 0	107 6	98 0	+ 9 8	+ 9 6	155 8	61 3	79 6	1 46	2 88	3 20	- 10 0	32	69	16	98
3	Nov 11, 25	10-10	98 6	233 4	47 90	1622	1558	+ 4 1	+ 64	1409	+ 15 1	+ 213				47 4	104 3	93 0	+ 12 2	+ 11 3	153 0	50 2	80 0	1 41	2 14	3 10	- 21 2	66	72	18	96
4	Nov 7, '25	11- 7	98 8	218 8	43 98	1521	1602	- 5 1	- 81	1441	+ 5 6	+ 80				50 1	110 2	91 0	+ 21 1	+ 19 2	151 7	59 8	80 4	1 44	2 67	3 20	- 16 5	- 53	72	15	98
5	Nov 7, 25	11-11	97 6	236 6	49 30	1644	1538	+ 6 8	+ 106	1393	+ 18 0	+ 251				47 3	101 0	88 0	+ 18 0	+ 16 0	149 9	59 0	79 9	1 39	2 59	3 10	- 16 5	51	68	17	101
6	Oct 27, '25	10- 9		227 3	46 47	1570	1557	+ 1 4	+ 22							47 3	104 1	92 0	+ 13 1	+ 12 1	152 3	59 9	80 1	1 42	2 61	3 10	- 16 1	- 49	83	20	97
7	Nov 25 '25	11-10	98 7	214 2	52 80	1696	1472	+ 14 1	+ 224	1323	+ 28 2	+ 373				41 9	92 2	85 0	+ 8 4	+ 7 2	147 4	58 0	74 4	1 29	2 28	2 80	- 18 9	- 52	99	16	100
9	Nov 17 '25	11 1	98 8	190 6	43 45	1324	1472	- 10 0	- 14	1281	+ 3 3	+ 43				42 3	93 4	75 8	+ 23 0	+ 17 6	141 4	55 7	76 6	1 27	2 27	2 86	20 6	- 59	90 5	14	99
11	Nov 18 25	11 11	98 2	254 4	48 12	1768	1687	+ 4 8	+ 81	1534	+ 15 3	+ 234				56 9	125 2	93 0	+ 34 7	+ 32 2	153 0	60 2	79 5	1 53	2 70	3 50	22 6	- 80	85	22	104
12	Feb 9, '26	11 11	98 6	268 6	52 20	1866	1651	+ 13 0	+ 215	1498	+ 24 6	+ 368				54 5	119 9	92 0	+ 30 3	+ 27 9	152 5	60 0	78 8	1 49	2 42	3 40	- 28 8	- 98	84	22	103
13	Nov 18, '25	11 4	98 8	184 7	44 60	1283	1386	- 7 4	- 103	1208	+ 6 2	+ 75				37 5	82 5	73 0	+ 13 0	+ 9 5	139 9	55 0	71 9	1 20	2 11	2 58	- 18 2	47	74	14	97
14	Nov 21, 25	11 2	98 4	186 9	40 60	1293	1518	- 14 8	- 225	1407	- 8 1	- 114				45 0	99 0	81 0	+ 12 2	+ 18 0	144 4	56 8	74 6	1 33	2 55	2 98	- 14 4	- 43	76	10 5	102
16	Nov 17 '25	11 9	98 5	208 0	43 30	1445	1561	- 7 5	- 116	1386	+ 4 3	+ 59				48 7	107 1	81 5	+ 31 4	+ 25 6	146 2	57 2	78 1	1 39	2 19	3 10	- 29 3	91	86	23 5	100
17	Nov 21 25	11- 9	98 5	218 4	44 20	1518	1563	- 2 8	- 45	1409	+ 7 7	+ 109				48 8	107 4	90 0	+ 19 3	+ 17 4	150 4	59 2	76 4	1 43	1 92	3 15	- 39 0	- 1 23	66	12	100
19	Nov 2, 25	11-11	98 7	228 5	45 90	1588	1556	+ 2 1	+ 32	1413	+ 12 3	+ 175				48 4	106 5	92 0	+ 15 7	+ 14 5	152 4	60 0	78 9	1 44	2 85	3 10	- 8 1	- 25	78	16 5	99
22	Feb 9, '26	11- 1	99 0	191 6	38 60	1352	1688	- 19 9	- 336	1483	- 8 8	- 131				55 6	122 3	81 6	+ 49 8	+ 40 7	145 2	57 2	72 9	1 46	2 58	3 45	- 25 2	- 87	68	13	113
24	Jan 28 '26	11- 8	98 5	224 5	43 60	1560	1609	- 3 0	- 49	1479	+ 5 5	+ 81				51 7	114 0	99 0	+ 15 2	+ 15 0	156 6	61 6	78 1	1 49	2 60	3 28	- 20 7	- 68	79	13	103
29	Feb 2, '26	11-10	98 0	202 5	41 05	1407	1566	- 10 1	- 159	1412	- 0 3	- 5				49 0	107 4	89 6	+ 19 0	+ 17 8	150 5	59 2	80 1	1 43	2 39	3 14	- 23 9	- 75	79	24	99
30	Feb 3, 26	11- 7	99 3	212 3	46 23	1475	1496	- 1 4	- 21	1337	+ 10 3	+ 138				44 7	98 3	85 0	+ 15 6	+ 13 3	147 4	58 0	77 5	1 33	2 48	2 97	- 16 5	- 49	100	28	93
31	Jan 16, '26	11-10	98 6	185 2	37 78	1286	1583	- 18 8	- 297	1411	- 8 9	- 125				50 1	110 2	85 0	+ 29 6	+ 25 2	147 3	58 0	78 0	1 42	1 94	3 20	- 39 4	- 1 26	74	18	102
35	Jan 16, '26	11 8	97 4	222 6	48 50	1546	1520	+ 1 7	+ 26	1341	+ 15 2	+ 205				46 2	101 6	79 0	+ 28 6	+ 22 6	148 0	58 6	75 6	1 33	2 20	3 02	- 27 2	- 82	81	23	102
38	Jan 27, '26	11 8	96 6	228 4	45 30	1587	1610	- 1 4	- 23	1458	+ 8 8	+ 129				51 8	114 0	91 4	+ 24 7	+ 22 6	151 9	59 8	78 4	1 46	2 60	3 28	- 20 7	- 68	83	24	102
40	Jan 27, '26	11 6	98 4	203 6	40 90	1428	1586	- 10 0	- 158	1441	- 1 8	- 13				50 3	110 5	92 0	+ 26 1	+ 18 5	152 7	60 1	79 9	1 48	2 66	3 20	- 16 9	- 54	68	9	99
44	Jan 16 26	12- 1	98 2	230 2	47 70	1599	1534	+ 4 2	+ 65	1385	+ 15 4	+ 214				47 0	103 4	89 5	+ 15 5	+ 13 9	150 5	59 2	80 0	1 40	3 07	3 06	+ 0 3	+ 01	80	18	97
45	Jan 28, '26	11 10	97 4	194 8	38 13	1354	1657	- 18 3	- 303	1482	- 8 6	- 128				54 9	120 7	86 6	+ 39 3	+ 34 1	148 4	58 4	75 6	1 48	2 20	3 40	- 35 3	- 1 20	78	16	108
46	Feb 2, 26	12- 1	98 2	186 6	41 50	1296	1478	- 12 3	- 182	1293	+ 0 2	+ 3				43 7	96 0	76 1	+ 26 1	+ 19 9	141 5	55 7	75 0	1 30	1 88	2 92	- 35 6	- 1 04	72	18	101
50	Jan 21, '26	12- 2	98 6	230 0	52 50	1598	1445	+ 10 6	+ 153	1284	+ 26 5	+ 314				41 7	91 7	81 0	+ 13 2	+ 10 7	145 0	57 1	78 0	1 27	2 11	2 83	- 25 4	- 72	78	24	98
51	Jan 23, '26	11- 3	96 9	205 1	45 30	1425	1498	- 4 9	- 73	1316	+ 8 3	+ 109				43 8	96 6	80 0	+ 23 3	+ 18 6	144 1	56 7	76 9	1 31	2 29	2 97	- 22 6	- 68	102	18	98
52	Jan 21, 26	11- 6	99 3	263 0	48 50	1827	1757	+ 3 8	+ 70	1577	+ 15 8	+ 250				60 1	132 2	92 8	+ 42 4	+ 39 4	153 0	60 2	81 2	1 57	2 64	3 60	- 26 6	- 96	92	15	104
53	Jan 21 26	12 1	100 3	207 2	48 40	1439	1509	- 4 6	- 70	1265	+ 13 7	+ 174				45 5	100 1	63 0	+ 58 9	+ 37 1	130 8	51 5	71 5	1 24	2 29	3 02	- 24 2	- 73	84	23 5	107
54	Jan 23 26	11 7	98 4	300 4	60 00	2087	1591	+ 31 2	+ 496	1439	+ 45 0	+ 648				50 6	111 3	90 8	+ 22 5	+ 20 5	151 5	59 6	81 0	1 45	2 78	3 02	- 7 9	- 24	90	18	99
56	Jan 21 26	10- 5	98 6	182 1	47 90	1266	1343	- 23 5	- 77	1124	+ 12 2	+ 142				34 3	75 5	61 1	+ 23 5	+ 14 4	130 6	51 4	70 4	1 10	1 62	2 40	- 32 5	- 78	66	23	99
	OVER-WEIGHT GIRLS																														
1	Nov 12, '25	11- 2	99 8	225 0	46 80	1563	1401	+ 11 5	+ 162							47 2	103 7	84 0	+ 23 4	+ 19 7	146 2	57 5	76 9	1 39	1 48	2 65	- 44 1	- 1 17	90	26	101
3	Nov 10, '25	11 2	98 9	186 4	43 80	1295	1243	+ 4 1	+ 52							37 2	81 8	82 0	- 0 2	- 0 2	144 1	56 7	76 5	1 23	2 39	2 60	- 8 1	- 21	83	20	94
4	Nov 5, 25	11 5	98 5	196 1	37 10	1362	1519	- 10 3	- 157							55 6	122 0	95 0	+ 28 6	+ 27 0	151 3	60 0	74 7	1 53	2 68	3 00	- 10 7	- 32	78	16	110
5	Nov 12 25	11- 6	97 4	184 0	42 00	1278	1298	- 1 5	- 20							41 5	91 3	83 0	+ 9 6	+ 8 3	145 5	57 3	73 5	1 27	2 02	2 43	- 16 8	- 41	71	18	101
6	Nov 14, 25	11- 5	99 2	244 8	44 80	1701	1579	+ 7 9	+ 122							60 0	132 0	100 0	+ 32 0	+ 32 0	155 4	61 2	83 2	1 58	2 42	3 14	- 23 0	- 72	87	12	101
7	Jan 23, '26	11 1	98 8	203 2	47 50	1411	1299	+ 8 6	+ 112							40 6	89 3	74 0	+ 20 7	+ 15 3	139 5	54 9	74 6	1 24	1 82	2 39	- 23 8	- 57	75	19 5	99
8	Dec 8, '25	11 8	98 5	206 1	42 60	1431	1387	+ 3 1	+ 44							47 4	104 3	88 0	+ 18 5	+ 16 3	148 6	58 5	77 4	1 40	1 92	2 60	- 26 1	- 68	79	18	100
10	Dec 9 '25	11- 1	98 3	256 2	46 60	1780	1570	+ 13 4	+ 210							60 7	133 5	94 0	+ 42 0	+ 39 5	151 7	59 7	79 1	1 59	2 79	3 20	- 12 8	- 41	90	13	107
11	Dec 9, 25	11-11	98 4	183 1	39 90	1272	1356	- 6 2	- 84							45 3	99 7	80 2	+ 24 3	+ 19 5	143 4	56 4	76 1	1 33	2 01	2 79	- 27 9	- 78	76	14	101
12	Dec 10, 25	11 5	98 0	185 6	45 20	1289	1244	+ 3 6	+ 45							37 2	81 8	73 0	+ 12 0	+ 8 8	138 7	54 6	73 7	1 19	1 81	2 20	- 17 7	- 39	77	18	97
14	Dec 12, '25	11 11	98 5	222 1	44 00	1543	1427	+ 8 0	+ 116							50 2	110 4	101 0	+ 9 3	+ 9 4	155 4	61 2	81 3	1 46	1 91	2 80	- 31 8	- 89	77	15	95
18	Dec 12, 25	11 5	98 6	190 4	43 75	1323	1311	+ 0 8	+ 12							41 4	91 0	76 4	+ 19 1	+ 14 6	141 3	55 6	75 1	1 26	1 94	2 42	- 20 1	- 48	100	14	99
20	Jan 7, 26	11- 2	98 5	213 4	46 82	1483	1362	+ 8 3	+ 114							45 1	99 2	80 4	+ 23 4	+ 18 8	143 7	56 6	77 6	1 32	1 90	2 60	- 26 9	- 70	100	17 5	98
22	Dec 10, '25	11- 5	97 9	209 7	44 60	1457	1399	+ 4 1	+ 58							47 1	103 6	84 0	+ 23 4	+ 17 6	146 2	57 5	76 0	1 36	2 35	2 67	- 12 0	- 32	70	12	102
26	Dec 15, '25	11 11	98 4	194 4	43 00	1351	1317	+ 2 6	+ 34							42 8	94 1	82 8	+ 13 6	+ 11 3	145 4	57 2	73 1	1 31	2 39	2 48	- 3 6	- 09	64	14	103
27	Jan 14 '26	11 9	97 2	204 5	47 70	1421	1290	+ 10 1	+ 131							41 0	90 2	74 0	+ 21 9	+ 16 2	138 8	54 7	72 5	1 24	2 05	2 40	- 14 5	- 35	77 5	15 5	102
29	Dec 15, '25	11- 3	98 4	227 2	50 60	1578	1383	+ 14 1	+ 195	1047	+ 50 7	+ 531				46 0	101 2	72 5	+ 39 1	+ 28 7	138 2	54 5	73 8	1 30	1 57	2 60	- 39 5	- 1 03	98	18	104
31	Dec 12, '25	11- 4	99 1	223 7	45 59	1554	1454	+ 6 9	+ 100							50 9	112 0	85 6	+ 30 8	+ 26 4	147 2	57 9	79 7	1 42	2 50	2 64	- 5 0	- 14	90 5	16	100
32	Jan 14, '26	10- 8	98 2	213 4	45 10	1483	1416	+ 4 7	+ 67							48 2	106 0	81 0	+ 30 8	+ 25 0	144 3	56 8	76 0	1 47	2 20	2 72	- 19 1	- 51	78 5	15	103
33	Dec 8, 25	11 8	98 4	171 9	39 20	1194	1629	- 26 6	- 435							41 2	90 6	81 0	+ 11 8	+ 9 6	143 7	56 6	73 5	1 27	2 14	2 40	- 10 8	- 26	85	14	101
34	Jan 13, '26	11 1	98 3	244 0	49 00	1695	1443	+ 17 4	+ 252							50 1	110 2	92 0	+ 19 7	+ 18 2	151 0	59 4	81 5	1 44	2 70	2 84	- 4 0	- 14	94	13	97
35	Dec. 16, '25	11- 1	97 0	216 3	43 16	1503	1463	+ 2 7	+ 40							51 5	113 1	90 0	+ 25 6	+ 23 1	150 8	59 0	79 6	1 45		2 86			71	12	100
37	Dec 12 '25	11- 9	98 6	219 5	42 90	1526	1431	+ 6 6	+ 95							50 4	110 9	89 6	+ 23 7	+ 21 3	149 8	58 9	77 9	1 48	2 46	2 60	- 5 4	- 14	78	12	102
39	Dec 16, 25	11 10	97 9	247 4	48 70	1719	1443	+ 19 1	+ 276							51 3	112 9	95 6	+ 18 1	+ 17 3	151 6	60 9	82 2	1 47	2 83	2 66	+ 6 4	+ 17	91	16	97
40	Dec 16, '25	11- 8	97 5	174 8	38 06	1215	1344	- 9 6	- 129							44 5	97 9	76 0	+ 28 8	+ 21 9	140 5	55 3	75 3	1 30	1 95	2 56	- 23 9	- 61	101 5	16	101
50	Jan 19, '26	11- 7	98 5	250 3	48 64	1739	1479	+ 17 6	+ 260							53 9	118 6	102.5	+ 15 7	+ 16 1	156 3	61 5	84 3	1 49	2 36	2 90	- 18 6	- 54	72	23	97
51	Jan 20, '26	11 1	99 7	190 2	44 40	1321	1277	+ 3 4	+ 44							39 2	86 2	74 8	+ 15 2	+ 11 4	140 3	55 2	72 2	1 24	1 85	2 32	- 20 2	- 47	83	21	101
52	Jan 19, '26	11 10	99 0	224 2	48 80	1557	1339	+ 16 2	+ 218							44 2	97 2	89 0	+ 9 3	+ 8 2	149 1	58 7	77 4	1 33	2 30	2 50	- 8 0	- 20	100	14 5	98
53	Jan 19, '26	11 5	98 0	223 5	47 24	1553	1412	+ 9 9	+ 141							48 0	105 6	79 6	+ 32 6	+ 26 0	143 3	56 4	75 1	1 37	1 87	2 70	- 30 7	- 83	75	16	104
54	Jan 19, '26	11- 5	98 0	186 4	42 78	1295	1309	- 1 1	- 14							41 2	90 6	76 4	+ 18 6	+ 14 2	141 1	55 6	75 6	1 26	1 66	2 40	- 30 8	- 74	96	31	98
	NORMAL-WEIGHT BOYS																														
1	Nov 11, '25	11 4	98 4	205 0	48 20	1424	1388	+ 2 5	+ 36	1267	+ 12 4	+ 157				37 6	82 7	78 0	+ 6 0	+ 4 7	143 2	56 3	74 2	1 23	2 29	2 50	- 8 4	- 21	80 5	10	97
3	Oct 31, '25	12 6	98 6	237 6	44 96	1651	1563	+ 5 6	+ 88	1489	+ 10 9	+ 162				49 8	109 6	117 0	- 7 2	- 7 4	165 0	65 0	83 5	1 53	3 43	3 20	+ 7 1	+ 23	73	26	95
4	Oct 27, '25	10-10		187 7	45 06	1304	1306	- 0 1	- 2				1186	+ 9 9	+ 118	33 3	73 3	72 0	+ 1 8	+ 1 3	138 3	54 4	73 5	1 13	2 39	2 37	+ 0 8	+ 2 0	70	27	94
5	Nov 14, 25	11- 0	99 0	195 3	46 45	1357	1339	+ 1 1	+ 18	1212	+ 12 0	+ 145	1220	+ 11 0	+ 137	35 0	77 0	84 0	- 8 4	- 7 0	147 6	58 1	78 6	1 22	2 06	2 44	- 15 6	- 38	76	18	90
6	Nov 14, '25	11- 3	97 5	172 8	47 20	1201	1223	- 1 8	- 22	1077	+ 11 5	+ 124	1095	+ 9 7	+ 106	29 2	64 2	69 4	- 7 4	- 5 2	136 7	53 8	69 4	1 06	1 96	2 06	- 4 8	- 10	79	14 5	95
7	Dec 3, '25	11- 4	98 6	196 0	52 00	1362	1262	+ 7 9	+ 100	1110	+ 22 7	+ 252	1142	+ 19 2	+ 220	31 1	68 4	71 0	- 3 7	- 2 6	138 1	54 3	72 9	1 09	1 83	2 45	- 25 4	- 62	89	20	92
8	Dec 5, '25	12- 0	97 8	193 5	44 44	1345	1384	- 2 8	- 39	1293	+ 4 0	+ 52	1281	+ 5 0	+ 64	38 3	84 3	86 2	- 2 2	1 9	148 1	58 3	74 9	1 27	2 10	2 63	- 20 1	- 53	74 5	13 5	97
9	Dec 5, '25	10-10	99 2	183 7	43 30	1276	1367	- 6 5	- 91	1229	+ 3 9	+ 47	1248	+ 2 3	+ 28	36 5	80 3	83 0	- 3 3	- 2 7	146 9	57 8	78 4	1 23	2 08	2 50	- 16 8	- 42	81	14	91
10	Nov 21, '25	11- 9	99 0	222 2	50 67	1543	1393	+ 10 8	+ 150	1256	+ 22 8	+ 287				38 8	85 4	85 0	+ 0 5	+ 0 4	147 1	58 0	76 1	1 27	2 21	3 66	- 39 6	- 45	69	12	96
12	Dec 3 25	11- 9	98 6	183 6	47 00	1275	1281	- 0 4	- 6	1127	+ 13 0	+ 148	1175	+ 8.5	+ 100	32 8	71 9	71 0	+ 1 2	+ 0 9	138 2	54 4	71 6	1 13	2 11	2 30	- 8 2	- 19	78	20	96
14	Dec 5, 25	11-10	97 4	214 8	44 40	1493	1480	+ 0 9	+ 13	1371	+ 8 8	+ 122				43 8	96 4	99 0	- 2 6	- 2 6	156 5	61 6	80 9	1 40	2 63	2 93	- 10 2	- 30	88	11	94
17	Nov 24, '25	11 3	98 7	215 3	51 48	1496	1351	+ 10 7	+ 145	1211	+ 23 5	+ 285	1232	+ 21 4	+ 264	35 6	78 3	81 0	- 2 1	- 2 7	145 7	57 4	75 3	1 21	2 22	2 46	- 10 6	- 24	79	20	94
18	Nov 25, 25	11- 3	96.9	230 4	52 10	1601	1414	+ 13 2	+ 187	1273	+ 25 7	+ 328				39 0	85 8	86 4	0 1	- 0 6	148 8	58 6	77 4	1 28	2 50	2 67	- 6 3	- 17	77	12	94
21	Feb 3, '26	11 8	98 5	198 5	47 50	1384	1331	+ 3 6	+ 53	1200	+ 15 0	+ 184	1228	+ 12 3	+ 156	35 4	77 9	82 0	- 5 0	- 4 1	145 5	57 2	76 2	1 21	2 25	2 46	- 8 5	- 21	77	16	93
22	Jan. 27, '26	11- 3	98 7	174 7	46 40	1214	1264	- 3 9	- 50	1114	+ 8 9	+ 100				31 2	68 6	71 5	- 4 1	- 2 9	138 1	54 5	73 2	1 09	1 94	2 24	- 13 2	- 30	79	21	93
23	Feb 3, '26	11 3	97 9	193 7	45 30	1346	1386	- 2 8	- 40	1241	+ 8 4	+ 105	1265	+ 6 4	+ 81	37 5	82 5	83 0	- 0 5	- 0 5	146 5	57 6	77 8	1 24	2 70	2 57	+ 5 0	+ 13	77	16	91
26	Feb 3, 26	11- 6	98 4	207 3	53 60	1440	1292	+ 11 4	+ 148	1127	+ 27 7	+ 313	1172	+ 22 8	+ 268	32 6	71 7	70 3	+ 2 0	+ 1 4	137 3	54 1	73 1	1 12	2 18	2 33	- 6 1	- 15	78	16	94
28	Feb 4, '26	11- 7	98 6	202 2	50 92	1404	1275	+ 10 1	+ 129	1154	+ 21 6	+ 250	1170	+ 20 0	+ 234	32 5	71 5	79 8	- 10 4	- 8 3	144 3	56 7	76 5	1 15	2 13	2 33	- 8 5	- 20	72	17	90
29	Jan 28, '26	11- 4	98 7	170 6	41 80	1185	1316	- 9 9	- 131	1170	+ 1 3	+ 15	1196	- 0.9	- 11	33 8	74 4	77 8	- 4 4	- 3 4	142 7	56 2	74 3	1 18	2 23	2 42	- 7 9	- 19	84	18	94
36	Feb 2, '26	11- 7	97 5	204 1	47 70	1418	1375	+ 3 1	+ 43	1230	+ 15 3	+ 188				37 8	83 2	81 0	+ 2 6	+ 2 2	144 9	57 0	76 1	1 24	2 28	2 59	- 11 9	- 31	78	20	95
42	Jan 28, '26	12- 1	98 0	225 2	50 20	1565	1411	+ 10 9	+ 154	1286	+ 21 7	+ 279				39 7	87 4	90 0	- 2 9	- 2 6	150 7	59 4	77 9	1 30	2 15	2 72	- 20 9	- 57	82 5	20	94
45	Feb 4, '26	11-11	95 0	201 7	46 70	1401	1366	+ 2 6	+ 35	1221	+ 14 7	+ 180	1261	+ 11 1	+ 140	37 3	82 1	81 0	+ 1 3	+ 1 1	144 5	56 9	73 7	1 25	1 87	2 56	- 26 9	- 69	88	16	98
51	Jan 27 '26	12- 0	99 0	193 6	52 40	1345	1236	+ 8 8	+ 109	1082	+ 24 2	+ 263	1128	+ 19 2	+ 227	30 5	67 1	68 9	- 2 6	- 1 8	136 4	53 3	72 5	1 07	1 00	2 21	- 14 0	- 31	72 5	17 5	92
53	Jan 26, '26	10- 2	98 9	206 7	49 00	1436	1386	+ 3 6	+ 50	1238	+ 15 9	+ 198	1249	+ 14 1	+ 87	36 6	80 5	84 0	- 4 1	- 3 5	147 0	57 9	75 0	1 22	2 09	2 65	- 21 2	- 56	92	10	100
	NORMAL-WEIGHT GIRLS																														
1	Oct 29, '25	10- 2	96 5	195 6	46 80	1359	1262	+ 7 6	+ 97							37 4	82 2	78 0	+ 5 3	+ 4 2	142 2	56 0	75 1	1 21	2 02	2 24	- 9 8	- 22	75	14	96
2	Oct 29, '25	10-11	96 2	170 9	43 10	1187	1175	+ 1 0	+ 12							33 2	73 0	71 0	+ 2 8	+ 2 0	138 0	54 3	72 9	1 14	2 08	2 06	+ 1 0	+ .02	83	12	95
3	Nov 4 '25	11 3	98 6	205 8	42 84	1430	1384	+ 3 3	+ 46							46 1	101 4	94 5	+ 7 3	+ 6 9	152 1	59 9	78 0	1 39	2 40	2 63	- 8 8	- 23	72	14 5	99
4	Nov 5 '25	11- 5	99 6	193 2	45 00	1342	1243	+ 7 9	+ 99							37 2	81 8	75 2	+ 8 6	+ 6 6	140 5	55 3	74 0	1 22	2 15	2 20	- 2 3	- 05	80	20	97
5	Nov 10 '25	11- 1	98 6	181 7	42 80	1262	1211	+ 4 2	+ 51							35 3	77 7	86 0	- 9 6	- 8 3	147 4	58 1	70 4	1 23	2 39	2 10	+ 1 3	+ 29	72	12	93
6	Dec 19, 25	11 2	99 1	165 1	45 52	1147	1382	- 17 0	- 235	997	+ 15 0	+ 150				29 0	63 8	66 0	- 3 3	- 2 2	133 2	52 3	71 8	1 05	1 63	1 88	- 13 3	- 25	74	13	92
8	Jan 7, 26	12 0	98 3	189 6	47 30	1317	1169	+ 12 6	+ 118				1045	+ 26 0	+ 272	33 7	74 1	81 0	- 8 5	- 6 9	145 7	57 4	78 1	1 16	1 90	2 10	- 9 5	- 20	83	16	89
9	Jan 6 '26	10- 5	99 2	184 2	51 35	1279	1129	+ 13 3	+ 150							29 9	65 8	63 0	+ 4 4	+ 2 8	131 5	51 8	68 8	1 04	1 62	1 90	- 14 7	- .28	101	22	97
10	Jan 13, '26	12 2	98 3	190 9	41 90	1326	1298	+ 2 2	+ 28				1287	+ 35 1	+ 39	41 5	91 3	92 0	- 0 7	- 0 7	150 9	59 4	80 9	1 32	2 08	2 43	- 14 4	- .35	72 5	16 5	92
11	Dec 19, '25	11- 3	98 0	170 8	45 78	1187	1438	- 21 1	- 251	1033	+ 14 8	+ 154				31 4	69 1	70 0	- 1 3	- 0 9	136 6	53 8	71 4	1 08	1 69	1 98	- 18 0	- 27	96	16	95
13	Jan 5, '26	10 8	99 6	174 6	45 59	1213	1158	+ 4 9	+ 55	1029	+ 8 2	+ 184				32 2	71 0	69 8	+ 1 8	+ 1 2	136 3	53 6	74 7	1 11	1 90	2 02	- 5 9	- 12	102 5	23 5	93
15	Dec 19 '25	12 0	99 1	217 6	48 50	1512	1273	+ 18 8	+ 239				1237	+ 22 2	+ 275	39 9	87 8	95 0	- 7 5	- 7 2	152 2	59 9	75 3	1 30	2 53	2 36	+ 7 2	+ 17	94	15	94
16	Jan 7, 26	11 7	98 3	160 1	45 80	1113	1071	+ 4 0	+ 42	941	+ 18 1	+ 172				27 6	60 7	62 6	- 3 2	- 1 9	127 6	50 2	68 9	1 01	1 39	1 80	- 22 7	- 41	80	16	94
19	Jan 13, 26	12 0	98 8	234 3	49 19	1628	1377	+ 18 9	+ 251				1442	+ 12 9	+ 186	46 5	102 3	86 0	+ 18 9	+ 16 3	147 1	57 9	77 2	1 37	1 90	2 64	- 28 1	- .74	88	21	100
23	Jan 14, '26	11 5	98 8	225 7	51 01	1568	1268	+ 23 6	+ 300						+ 161	38 7	85 1	91 0	- 6 4	- 5 9	150 3	59 1	79 0	1 28	2 59	2 30	+ 12 6	+ 29	103	17	92
24	Jan 13, '26	11 7	99 0	196 0	44 65	1362	1254	+ 8 4	+ 108				1201	+ 13 4		38 7	85 3	89 0	- 5 3	- 3 7	149 4	58 8	76 2	1 27	2 11	2 30	- 8 3	- 19	90	20	96
27	Jan 5, '26	11- 5	97 2	199 3	48 50	1385	1209	+ 14 5	+ 176							35 2	77 4	79 6	- 2 7	- 2 2	143 4	56 4	76 0	1 19	1 38	2 15	- 35 8	- 77	90	19 5	93
31	Jan 9, '26	11 9	98 2	224 3	44 40	1558	1396	+ 11 6	+ 162							48 0	105 6	103 0	+ 2 5	+ 2 6	156 6	61 6	82 5	1 46	2 49	2 71	- 8 1	- 22	74 5	13 5	95
32	Dec 17, '25	11 9	98 0	209 9	41 06	1458	1412	+ 3 3	+ 46						- 64	49 1	108 0	105 0	+ 2 8	+ 3 0	157 3	61 9	82 9	1 48	2 91	2 76	+ 5 8	+ 15	69	18	95
34	Dec 19, 25	11- 5	97 6	224 5	48 20	1560	1346	+ 15 9	+ 214				1522	- 4.6		43 6	95 9	95 0	+ 0 9	+ 0 9	152 1	59 9	80 4	1 35	2 39	2 52	- 5 2	- 13	90	18	94
35	Jan 6, '26	11- 1	98 6	175 1	47 40	1217	1126	+ 8 1	+ 91	1029	+ 18 2	+ 188				30 5	67 1	69 0	- 2 8	- 1 9	130 3	53 6	70 9	1 07	2 00	1 91	+ 3 1	+ 06	78 5	19 5	94
39	Jan 6, '26	11- 6	98 0	166 1	44 95	1154	1144	+ 8 7	+ 10							31 5	69 3	68 0	+ 1 9	+ 1 3	134 4	52 9	70 6	1 07	1 62	2 00	- 19 0	- 38	88 5	19	96
40	Jan 5, '26	11- 7	98 0	190 3	40 20	1322	1154	+ 14 5	+ 168				1017	+ 29 9	+ 305	32 8	72 2	72 0	+ 0 2	+ 0 2	137 7	54 2	72 0	1 12	2 12	2 00	+ 6 0	+ 12	72	12	96
47	Feb 10, '26	11 11	98 0	174 3	43 90	1211	1156	+ 4 7	+ 55				1020	+ 18 7	+ 191	32 9	72 4	76 2	- 4 9	- 3.8	130 6	55 3	76 7	1 15	1 49	2 05	- 27 3	- .56	80	20	90
51	Jan 26, '26	11 11	97 7	179 6	44 80	1248	1175	+ 6 2	+ 73				1056	+ 18 2	+ 192	34 1	75 0	75 4	- 0 01	- 0 4	140 0	55 1	74 4	1 10	1 75	2 10	- 16 6	- 35	92	18	94
53	Jan. 20, '26	11-10	99 6	187 5	50 30	1303	1152	+ 13 1	+ 51				1014	+ 28 5	+289	32 7	71 9	70 0	+ 2 7	+ 1 9	135 8	53 5	73 5	1 08	1 70	2 00	- 15 0	- 30	77 5	19	94
57	Feb 6, '26	12- 0	98 2	205 4	40 70	1427	1503	- 5 1	- 76				1724	- 17 2	- 207	52 6	122 3	122 0	+ 0 0	+ 0 3	167 5	65 9	89 7	1 62	3 00	3 02	- 0 7	- .02	81	12	92

and DuBois [33] who actually modelled individuals of many different heights and weights by encasing them in flexible textile forms on which paper was glued while they were still on the subjects. When the paper was set the form was removed by cutting and the areas of the patterns were computed. The formula which was originally used in determining the chart was: Area (sq. cm.) $= \text{Wt.}^{0.425} \times \text{Ht.}^{0.725} \times 71.84$ where Wt. equals weight in kilograms and Ht. equals height in centimeters. The chart shows areas in square meters for body-weight in kilograms ranging from 20 to 110 kilograms, and heights in centimeters from 100 to 200 centimeters; while the range of square meters of body surface is from .8 to 2.3 square meters.

Estimates on the DuBois chart are then estimations of apparent fatness and leanness. By virtue of its origin it shows that when people are of certain constant weights their surface areas are different if they vary in height, and the same is true if they are of the same height but of different weights. In other words, a man who weighs 200 pounds and who is 6 feet tall will have a different surface area than a man who is 5.8 feet tall weighing the same number of pounds; and the same is true when weight is the variable and height the constant.

EXPERIMENTAL SUBJECTS AND GENERAL RESULTS

Only the over-weight and normal-weight children were invited to coöperate in the basal metabolism determinations as it was thought data secured for them would be more worthwhile—there are so few data [113] at this age for these body-weight groups, the under-weight group has been of greater research concern [92]. About 117 children in all responded, as shown in the table of individual basal metabolism determinations.

The original plan was to secure four periods of data for each child on two different mornings, but in this report only the first two periods (which is the usual clinical procedure, and which results are accepted as indicating the trend for the most part for that individual for a six-month period, other things being equal) are reported.[1]

MacLeod found, with normal-weight girls of 11-14 from a private school, that the novelty of the experience (which might cause apprehension or excitement and so condition the complete mental repose and muscular relaxation desired in this test), as measured by the results of the first two tests on all subjects when averaged separately and compared with those of all later tests, was negligible, the difference of 0.8 showing the later tests to be that much lower. About the same result, no doubt, will be found for the subjects of this study (though they are predominantly public school children of the two sexes and of the two different body-weights) since great care has been taken to insure the proper conditions on subsequent mornings. Children who were emotionally disturbed because of the novelty of the experience or who were restless reacted to the test accordingly, which will make it necessary to secure them the third time or as many more times as necessary until it is certain that controlled conditions are fulfilled. The possibilities of the respiration apparatus for psychological emotional studies were clearly revealed with these subjects. Some kymograph records are shown in Figures 4, 5, and 6. Two very eccentric records are shown in Figure 6, the one subject showing the results of the first and second periods as if they were the records of two different persons. The kymograph record in Figure 4 shows a regular reaction but of very slow deep breathing (typical of a low metabolic rate). Figure 5 shows a shallow type of breathing but regular as well as rapid in nature (typical of a high metabolic rate).

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[1] Not all of the second morning determinations will be completed until June, after which time they will appear in a separate publication.

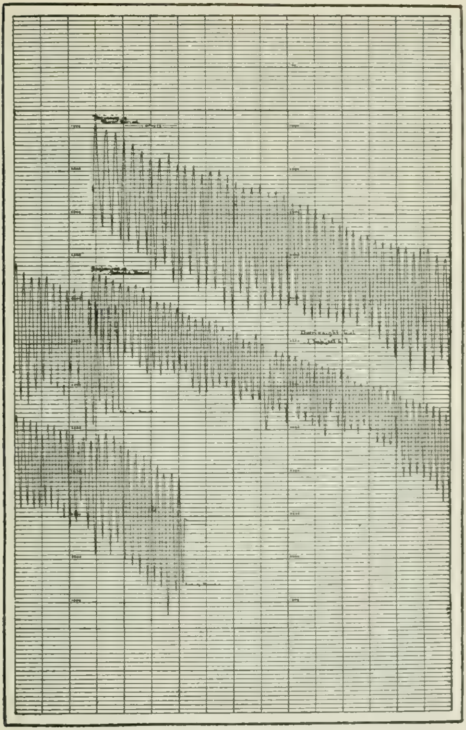

FIG. 4. SLOW DEEP BREATHING (REGULAR)

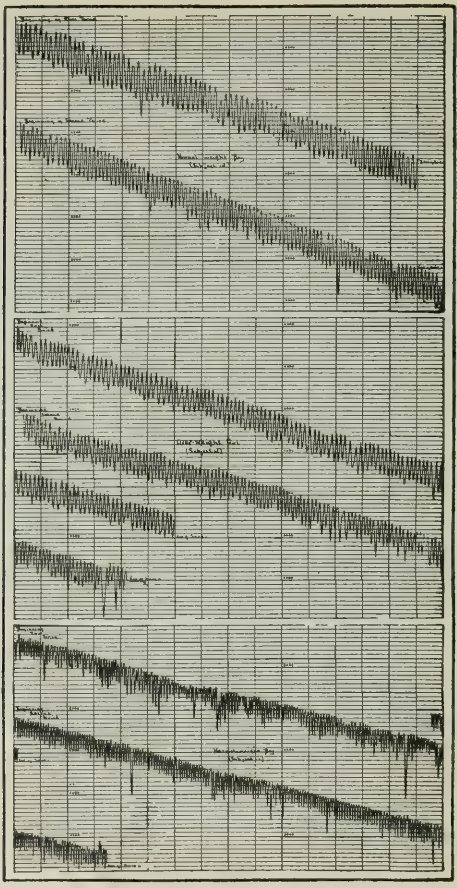

FIG. 5. SHALLOW RAPID BREATHING (REGULAR)

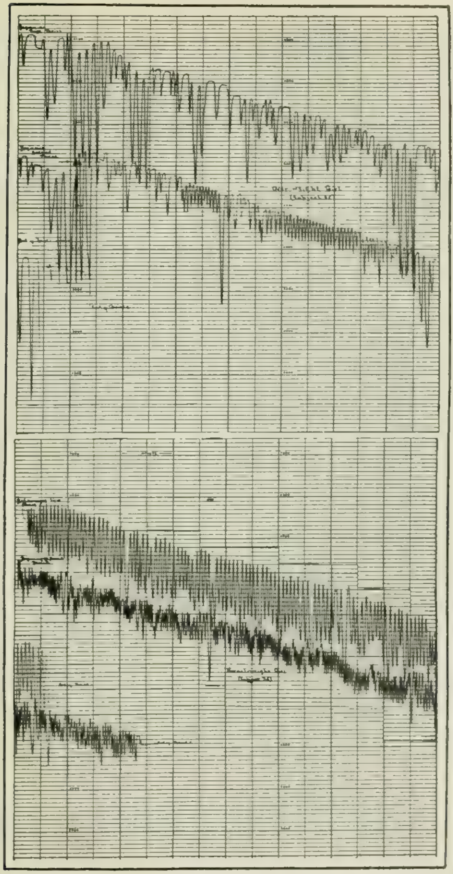

FIG. 6. ECCENTRIC BREATHING (IRREGULAR)

SPECIFIC RESULTS

Results are shown throughout for only a part of the 117 volunteers as only the following numbers up to the present time were thought to have fulfilled the conditions as far as objective signs could be judged; namely, 32 over-weight boys, 30 over-weight girls, 24 normal-weight boys and 27 normal-weight girls. The results are expressed in Table XXIV in terms of point measures for the sex groups, and differences are shown for the total groups where they are not so obvious.

The table shows the over-weight boys to have 68 per cent of their cases around average weighing from 42.61 to 53.77 kilograms and the over-weight girls from 40.10 to 53.50 kilograms; the normal-weight boys range from 31.73 to 39.97 kilograms while the normal-weight girls are between 30.05 and 93.95 kilograms. The body surface area expressed in square meters shows the boys of the over-weight group to be slightly heavier than the girls of the same group, while the girls of the normal-weight group are slightly heavier than the boys of that group.

The standing height and sitting height in centimeters of the over-weight group are significantly higher than those for the normal-weight group, as shown by the difference of the means which is three times the probable error.

No significant difference is shown when the average pulse rates of the two body-weight groups are compared. The pulse rate for the larger group (Table XIX) showed a significant difference when the over-weight and under-weight groups were compared, but no significant difference when the over-weight and normal-weight groups were compared.

The average respiration rate shows the normal-weight girls to be highest with a mean of 18.69 and a range for 68 per cent of their cases from 14.13 to 23.25; while the over-weight boys who are next highest have an average rate of 17.90 with a range for the same number of cases from 14.35 to 21.45. The respiration rate throughout shows but little difference when comparing the total groups, which indicates the degree of stability at the time in the subjects selected for this report.

Sub-lingual temperature results indicate that both the over-weight and normal-weight groups had average temperatures for the most part on the morning of the basal metabolism determin-

TABLE XXIV

Summary of Results of Individual Basal Metabolism Determinations

(Expressed by point measures and differences)

Sex Groups	Over-weight Boys		Over-weight Girls		Normal-weight Boys		Normal-weight Girls	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Wt. Clothed but without Shoes (Kgs.).........	48.19	5.58	46.80	6.70	35.85	4.12	37.00	6.95
Standing Height (cms.).	147.88	6.10	146.20	5.26	144.85	6.30	149.96	9.11
Standing Height (ins.)..	58.31	2.42	57.53	2.15	57.04	2.55	56.60	3.48
Sitting Height (cms.)...	77.44	2.87	76.93	3.23	75.50	2.88	75.98	4.71
Body Surface Area (sq. m.).............	1.39	.11	1.32	.10	1.20	.08	1.22	.15
Average Pulse Rate....	80.75	9.55	84.06	10.53	79.23	6.18	83.83	9.76
Average Respiration Rate	17.90	3.55	17.27	4.12	17.54	4.24	18.69	4.56
Sub-lingual Temp......	98.51	.68	98.44	.63	98.94	.81	98.40	.90
Oxygen consumption (cc. min.)...........	231.13	28.92	211.00	22.89	201.25	17.03	191.30	19.55
Dreyer Deviation (per cent)...............	6.56	9.34	5.10	8.98	3.00	5.52	—1.13	10.78

Total Groups		Mean	S. D.	Diff. of *M*'s	P. E.$_{dM}$
Standing Height (cms.)—	Normal-weight....Group	144.38	7.92	2.68	.87
	Over-weight......Group	147.06	5.77		
Sitting Height (cms.)—	Normal-weight....Group	75.75	3.96	1.44	.45
	Over-weight......Group	77.19	3.07		
Average Pulse Rate—	Normal-weight....Group	81.65	8.58	.70	1.17
	Over-weight......Group	82.35	10.18		
Average Respiration Rate—	Normal-weight....Group	17.73	3.90	.27	.52
	Over-weight......Group	18.00	4.41		
Sub-lingual Temperature—	Normal-weight....Group	98.05	.90	.43	.10
	Over-weight......Group	98.48	.66		
Oxygen Consumption— (cc per min.)	Normal-weight....Group	199.23	26.70	16.92	3.34
	Over-weight......Group	216.15	26.62		
Dreyer Deviation per cent—	Normal-weight....Group	5.38	7.98	3.19	1.17
	Over-weight......Group	2.19	10.34		

ations. Sometimes sub-lingual temperature is below normal at so early an hour and under post-absorptive conditions, but this is usually of no consequence. It takes almost a febrile condition to disqualify a person on the basis of too high a temperature for normal energy requirement determination.

Results of the oxygen volume consumed per minute indicate that the over-weight group used more oxygen than the normal-weight group. Abnormal conditions which may increase oxygen consumption are: a hyper-function of glandular secretion, apprehension or any emotional disturbance, twitching or moving the limbs when restless or fatigued, a higher sub-lingual temperature than normal, or recent intake of food. All of the conditions just mentioned were controlled in advance, in so far as possible, except where there were temporary emotional states giving no objective or observable signs.

The basal metabolic rates as expressed by the mean difference (measured by its probable error) of deviations in per cent from the Dreyer norms [1] indicate the over-weight boys and girls are slightly lower than the normal-weight groups, but the major number of both are with the normal range of 10 per cent plus or minus. The deviations in per cent from the Dreyer norms or the basal metabolic rates range as follows: from — 2.78 to + 15.90 for the over-weight boys (mean of 6.56); from — 3.88 to + 14.08 for the over-weight girls (mean of 5.10); from — 2.52 to + 8.52 for the normal-weight girls (mean of 3.00); ad from — 11.91 to + 9.65 for the normal-weight girls (mean of — 1.13). However, when the total groups are considered regardless of sex, the over-weight group is shown to be significantly lower; but the lower limit of the range (— 8.15 to + 12.53) for 68 per cent of the cases is within the standard limit set for normal basal metabolism, as is that shown for the normal-weight group (— 2.60 to + 13.36). The deduction from the standard deviations of the basal metabolic rates is that about 68 per cent or more of the over-weight group are over-weight because of life habits while about 16 per cent are over-weight from a glandular disturbance (in so far as the basal metabolic rate per cent predicts this to be the case) as they lie outside the normal line of 10 per cent minus. When actual percentages are noted, 28.12 per cent of the over-weight boys and 6.67 per cent of the over-weight girls, or 17.40 per cent of the over-weight group and only 3.71 per cent of the normal-weight group (none of the normal-weight boys) have low metabolic rates indicative of an endocrine dysfunction, other things being equal. However, the second sets of figures to be accumulated by June will either verify this number or change it to be greater or less; there may be more definite reasons revealed when the composite data are analyzed to show that these basal metabolic rates as measured by oxygen consumption and calculated calory need are higher or lower than they otherwise would be.

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[1] Dreyer norms were the only ones that could be used throughout for all children, as other norms were not adapted to all the children; whenever possible, however, other norms are stated in the parallel columns of the individual determinations.

A NUTRITION INDEX

Von Pirquet [122] studied Viennese children and found that the sitting height was more useful than the standing height when weight and height were considered in relation to nutritional status. He used as his index the pelidisi, which is based on the relationship between weight in grams and sitting height in centimeters. The formula is:

$$\frac{\sqrt[3]{10 \times \text{weight in grams}}}{\text{Sitting height in centimeters}} = 100 \text{ per cent.}$$

Table XXV gives the pelidisi for the sex groups and for the total groups in terms of point measures:

TABLE XXV
Von Pirquet Pelidisi

	Mean	S. D.
Over-weight Boys	101.03	3.50
Over-weight Girls	100.94	3.31
Normal-weight Boys	94.82	2.44
Normal-weight Girls	95.00	2.50

	Mean	S. D.	Diff. of M's	$P.E._{dM}$
Normal-weight Group	94.91	2.47	6.08	.72
Over-weight Group	100.99	3.41		

The difference of the means of the pelidisi for the normal-weight and over-weight groups is very significant in that it is eight times the probable error in favor of the over-weight group. The normal-weight group results almost overlap the results found by Terman [115] for gifted eleven-year-old children (Boys: mean = 94.21; S. D. 3.54. Girls: mean = 94.89; S. D. 3.79) but the over-weight group exceed that group by about five per cent.

FOODS LIKED AND EATEN

Table XXVI indicates some of the foods liked and those that were eaten in amounts every day. The foods suggested were those thought to be most fattening when eaten abundantly and consistently [79]. Those foods liked very much were expressed by underlining and those they "eat a great deal of each day" by putting a cross before them.

TABLE XXVI

Foods Liked and Eaten

(Expressed in percentages)

Underline the things you like to eat very much. Put a cross (X) before those you eat a great deal of each day.

	Underlined						Crossed					
	Boys			Girls			Boys			Girls		
	O	N	U	O	N	U	O	N	U	O	N	U
Cereals	59	50	47	60	51	68	41	50	53	40	49	32
Fruits	55	57	57	45	46	50	45	43	43	55	54	50
Vegetables	48	54	47	45	39	45	55	46	53	55	61	55
Meat	66	51	66	52	69	58	34	49	34	48	31	42
Pastry	72	71	69	60	77	80	28	29	31	40	23	20
Cookies	76	69	28	61	66	77	24	31	22	39	34	23
Potatoes	65	46	51	51	48	52	35	54	49	49	52	48
Bread	58	53	45	43	41	48	42	47	55	57	59	52
Butter	54	57	48	47	46	48	46	43	52	53	54	52
Ice-cream	72	76	71	56	70	65	28	21	29	44	30	35
Pie	77	72	69	61	81	77	23	28	31	39	19	23
Sugar	65	56	67	42	56	66	35	44	33	58	44	33
Tomatoes	71	66	50	56	61	65	29	33	50	44	39	35
Milk	56	50	50	40	44	49	44	50	50	60	56	51
Rice	72	71	64	64	63	66	28	29	36	36	27	33
Soup	61	59	56	55	55	54	39	41	44	45	45	46
Beans	68	58	59	55	54	71	32	42	41	45	46	29
Cake	68	65	71	59	62	65	32	35	29	41	38	35
Salads	68	63	57	58	52	51	32	37	43	42	48	49
Cabbage	65	81	57	55	59	65	35	19	43	45	41	35

The foods listed are summarized as follows by indicating which group ate the most each day of that food article:

Summary of Food Eaten

Over-weight Boys ... (Fruits, vegetables)
Over-weight Girls ... (Fruits, meat, pastry, cookies, ice-cream, pie, sugar, tomatoes, rice, cake, cabbage, milk)
Normal-weight Boys.. (Meat, potatoes, beans, cake, milk)
Normal-weight Girls.. (Cereals, vegetables, cookies, potatoes, bread, butter, sugar)
Under-weight Boys .. (Cereals, pastry, peas, bread, butter, ice-cream, pie, tomatoes, milk, rice, soup, salad, cabbage)
Under-weight Girls .. (Soup, salads)

Summary of Food Liked

Over-weight Boys ... (Cereals, meat, pastry, potatoes, bread, pie, milk, soup, salad, beans, rice)

Over-weight Girls	(Vegetables, potatoes, soup, salads)
Normal-weight Boys	(Fruits, vegetables, peas, butter, ice-cream, cabbage)
Normal-weight Girls	(Meat, peas, ice-cream, pie, soup)
Under-weight Boys	(Fruits, meat, cookies, sugar, cake)
Under-weight Girls	(Cereals, vegetables, pastry, cookies, bread, butter, sugar, milk, rice, beans, cake, cabbage)

The summary shows a great variation of tastes and actual food eaten which would indicate that in these respects foods are liked and eaten by each group regardless of body-weight, but that the data are very subjective in origin.

CALORIES REQUIRED AND CONSUMED

Calories per 24 hours as calculated in the basal metabolism determinations show the data in Table XXVII when assembled as being the calories of heat needed to maintain the body-workings (as heart action, etc) when the individual is in the post absorptive state.

TABLE XXVII

Calory Need

(Average calory need per 24 hours)

	Mean	S. D.
Over-weight Boys	1542.25	187.25
Over-weight Girls	1465.00	163.00
Normal-weight Boys	1394.80	124.00
Normal-weight Girls	1339.80	143.25

This table shows the actual calculated calory need to maintain the body functions at the present weight as determined by the basal metabolism procedure for the two body-weight groups. (It was this calculation of the calory need per 24 hours which was compared with the Dreyer predicted calory need per 24 hours for body-weight in grams and age in years which yielded the deviation per cent used as the basal metabolic rate.) Theoretically, then, when a sufficient allowance is made for body growth and exercise any further number of calories will make for fatness and the contrary for leanness in exogenous obesity [5,73].

The Sherman norms of the calory need of growing boys and girls of eleven years of age gives 2553 as the mean number for boys and 2000 as the mean number for girls. Sherman allows in addition to the number of calories required to run "internal workings" calories for body growth and muscular exercise [1,55].

Many authorities [1, 8, 55, 79] advocate that there should be no "counting of calories" with growing children as they need and can use a great many calories. They believe the essential thing is to insure a balanced diet with regulated life habits. When the individual wished more food they would give him all he wished, regardless of the number of calories; but the food would not be the favorite or the most pleasing but a combination or balanced variety, other things—exercise and the like—being equal.

A carefully worked out record blank asking for a detailed itemized statement of each food article and quantity consumed at each meal and between meals, was sent to the home of each child with instructions to keep the record every day for one school week. The purpose was to tabulate the returns, convert the amounts into calories, and then into vitamines [102]. The calory consumption when compared with the Sherman norms gives the following means and sigmas: the mean deviation for the over-weight boys is + 12.3 (S. D. 438.50) and — 305.8 (S. D. 361.67) for the over-weight girls; the mean deviation in calory consumption for the normal-weight boys, — 729.0 (S. D. 353.68) and for the girls of that group, — 684.42 (S. D. 456.77). The reports are very inaccurate and merely indicate the trend of calory consumption—namely, that the boys are consuming on the average more calories (over-weight 2540.70, normal-weight 1823.93) than the girls (over-weight 1694.19, normal-weight 1315.58)—which is consistent with the norm trend which allows more calories for the boys. Vitamine computations were not made when it was found that the reports were so inaccurate.

SUMMARY

1. A basal metabolism or nutrition study was made, following the MacLeod procedure, with the Sanborn Benedict Portable Apparatus of the closed circuit type and with the method of indirect calorimetry. One measure within the many measures was described, namely, the body surface area which gives the index of the apparent state of fatness and leanness when either height or weight varies.

2. The first morning's basal metabolism results were reported in raw data form as individual determinations showing in addi-

tion three figures of kymograph records or three typical kinds of response to the test. Only 32 over-weight boys, 30 over-weight girls, 24 normal-weight boys, and 27 normal-weight girls were used in mid-point measure calculations as some children were obviously apprehensive of this new experience, necessitating re-tests until they satisfy controlled conditions.

3. Standing height and sitting height were significantly higher for the over-weight group.

4. Pulse and respiration rates were about the same for the over-weight and normal-weight groups.

5. Children of the over-weight and normal-weight groups presented normal sub-lingual temperature on the mornings of the basal metabolism determinations, thus eliminating abnormal temperature as a probable causal factor for high or low metabolic rates.

6. The over-weight group used almost 17 cc. more of oxygen per minute on the average than the normal-weight group.

7. The basal metabolic rates, as expressed by the deviations in per cent from the Dreyer norms, indicated that 17.40 per cent of children were fat from a glandular disturbance (other things being equal), while 82.60 were fat from other causes.

8. The Von Pirquet pelidisi or nutrition index based upon the relation of sitting height to weight in grams showed the over-weight group had a higher nutrition index when compared to the normal-weight group.

9. The average calory need for 24 hours to maintain body functions at the present body-weights suggested that when a sufficient additional allowance is made for growth and exercise any further number of calories will make for fatness; and the contrary for leanness in exogenous obesity.

CHAPTER VII

INTELLIGENCE AND EDUCATIONAL ACHIEVEMENT

INTELLIGENCE

Although there are many mental tests from which to choose, nevertheless, whenever time allows but one to be given and demands that that one be the most reliable one possible, the Stanford-Binet Test stands out distinctly.

The Stanford-Binet Test was given to all the children who were selected by the original criteria for the three body-weight groups, as shown graphically in Figure 7, and the means and standard deviations in Table XXVIII show the differences in mental ages and intelligence quotients as they were found to exist.

The data in Table XXVIII show the over-weight boys to have the highest mental age, with the smallest standard deviation of all groups. This would indicate that 68 per cent of the over-weight boys are within 1 year and 9 months of the average mental age found for that group (13 years 2 months). The under-weight boys have the next highest mental age of 12 years 3 months, which is nine months lower than the over-weight boys, and their standard deviation is the third highest, indicating that there is a wider spread of mental ability in the 68 per cent of their cases than is found among the over-weight boys. The girls, groups present about the same mental age but with two months of mental age in favor of the normal-weight girls; the standard deviation of the under-weight girls is the highest and is closely followed by that of the over-weight girls, showing the spread in these two groups to be greater than that of the normal-weight girls.

The means and sigmas of the intelligence quotients show the relationships of chronological age to mental age to be quite consistent with those for the mental ages found, except for the normal-weight group, where the girls are found to have a higher intelligence quotient than the boys who surpass the girls of this

TABLE XXVIII

Mental Ages and Intelligence Quotients

(Stanford-Binet Test)

Sex Groups	Mental Age			Intelligence Quotient	
	Mean Yrs.	Mos.	S. D.	Mean	S. D.
Over-weight Boys	13	2	21.18	114.00	15.98
Over-weight Girls	11	5	24.38	99.92	18.95
Normal-weight Boys	11	9	27.87	102.92	18.53
Normal-weight Girls	11	7	23.71	113.42	16.82
Under-weight Boys	12	3	26.85	106.85	20.84
Under-weight Girls	11	5	24.88	97.85	18.00

Total Groups	Mental Age				Intelligence Quotient			
	Mean	S. D.	Diff. of M's	P.E.$_{dM}$	Mean	S. D.	Diff. of M's	P.E.$_{dM}$
Under-weight Group	11.82	2.20	.16	.20	102.35	19.99	.18	1.77
Normal-weight Group	11.66	2.16			102.17	17.71		
Normal-weight Group	11.66	2.16	.66	.20	102.17	17.71	4.79	1.71
Over-weight Group	12.32	2.09			106.96	18.89		
Under-weight Group	11.82	2.20	.50	.20	102.35	19.99	4.61	1.82
Over-weight Group	12.32	2.09			106.96	18.89		

group in mental age status. The facts indicate that the over-weight boys of the chronological age of 11 years are of superior intelligence since they come within the Terman classification of intelligence quotients range of 110-120, while the over-weight girls and the other groups fall within the range of 90-110, which is classified as normal or average intelligence.

When the total body-weight groups are considered, regardless of sex, the conclusion is reached that body-weight has little to do with the possession of a certain degree of intelligence. The only difference existing between groups, which seems more than a chance difference, is when the mental age of the over-weight group is compared with that of the normal-weight group as the difference of the means (.66) is slightly more than three times the probable error (.20) in favor of the over-weight group.

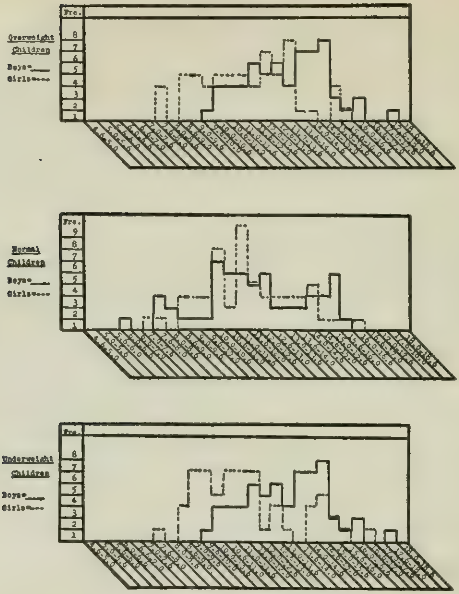

FIG. 7. MENTAL AGE OF CHILDREN

EDUCATIONAL ACHIEVEMENT

To secure a measure of school achievement, three educational achievement tests were given for no other reason than that they had been selected by the Horace Mann School for Girls and time could not be secured to give subjects selected from the school a test covering a wider range of school subjects, such as the Stanford Achievement Test. The three tests used were: the Morrison-McCall Spelling Test, List 1; the Thorndike-McCall Reading Test, Form 7; and the Woody-McCall Arithmetic Test, Form III. The raw scores were transmuted into the McCall G scores, which scores are based upon the McCall T scale which reduces for comparative purposes all raw scores obtained to a common denominator. The Ga or grade arithmetic score, the Gr or grade reading score, the Gs or grade spelling score, and the Gi or grade mental age are transmuted directly from the McCall G score sheets; the Ge or educational grade is the average of the weighted Gs, Ga, Gr; while the Gp or grade progress or accomplishment index for mental age is Gi plus Ge divided by their weights. The grade achievement scores in terms of means and standard deviations are given in Table XXIX.

TABLE XXIX

SCHOOL ACHIEVEMENT

(Means and standard deviations of the McCall G scores)

Sex Groups	Gr		Gs		Ga		Ge		Gi		Gp	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
O-w Boys.......	7.52	2.65	7.42	1.82	7.39	1.31	7.43	1.54	7.56	1.80	7.48	1.51
O-w Girls.......	5.69	1.88	6.89	1.76	6.96	1.20	6.44	1.28	5.92	1.96	5.69	1.53
N-w Boys.......	6.02	2.46	6.37	1.75	6.38	1.46	6.27	1.52	6.15	2.15	6.24	1.75
N-w Girls	5.73	1.85	7.00	1.77	6.99	1.60	6.59	1.37	5.90	1.88	6.26	1.52
U-w Boys.......	6.15	3.00	6.65	2.26	6.61	1.38	6.43	1.71	6.77	2.35	6.59	1.89
U-w Girls......	5.62	2.45	6.50	2.18	6.84	1.72	6.22	1.76	5.83	1.96	5.94	1.82

TABLE XXIX (*Continued*)

	Total Groups	Mean	S. D.	Diff. of M's	P. E.$_{dM}$
Gr	Under-weight Group	5.88	2.35	.01	--
	Normal-weight Group	5.87	2.18		
	Normal-weight Group	5.87	2.18	.74	.22
	Over-weight Group	6.61	2.47		
	Under-weight Group	5.88	2.35	.73	.23
	Over-weight Group	6.61	2.47		
Gs	Under-weight Group	6.58	2.22	.10	.19
	Normal-weight Group	6.68	1.79		
	Normal-weight Group	6.68	1.79	.47	.17
	Over-weight Group	7.15	1.81		
	Under-weight Group	6.58	2.22	.57	.19
	Over-weight Group	7.15	1.81		

TABLE XXIX (*Continued*)

	Total Groups	Mean	S. D.	Diff. of *M*'s	P. E.$_{dM}$
Ga	Under-weight Group	6.67	1.56	.01	--
	Normal-weight Group	6.68	1.56		
	Normal-weight Group	6.68	1.56	.50	.13
	Over-weight Group	7.18	1.27		
	Under-weight Group	6.67	1.56	.51	.13
	Over-weight Group	7.18	1.27		
Ge	Under-weight Group	6.33	1.74	.10	.15
	Normal-weight Group	6.43	1.45		
	Normal-weight Group	6.43	1.45	.51	.14
	Over-weight Group	6.94	1.50		
	Under-weight Group	6.33	1.74	.61	.15
	Over-weight Group	6.94	1.50		
Gi	Under-weight Group	6.30	2.21	.27	.20
	Normal-weight Group	6.03	2.02		
	Normal-weight Group	6.03	2.02	.71	.19
	Over-weight Group	6.74	2.05		
	Under-weight Group	6.30	2.21	.44	.20
	Over-weight Group	6.74	2.05		
Gp	Under-weight Group	6.26	1.88	.01	--
	Normal-weight Group	6.25	1.64		
	Normal-weight Group	6.25	1.64	.59	.15
	Over-weight Group	6.84	1.65		
	Under-weight Group	6.26	1.88	.58	.17
	Over-weight Group	6.84	1.65		

The Ge array of means and sigmas as shown in Table XXIX and Figure 8 indicates the over-weight boys to be the most advanced in the three school subjects with the normal-weight girls next and then the over-weight girls, the under-weight girls are poorest in these subjects. The Gi scores show the over-weight boys and the under-weight boys to have the highest intelligence as measured by the mental age, which is the same as found previously in the mental age study. The Gp scores in this table show, considering the mental ages of these children and their school achievement records, that the over-weight boys are accomplishing the most as compared with the other boys, while the

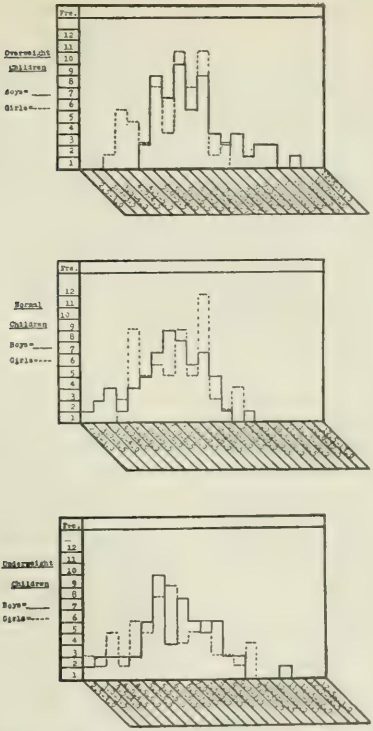

Fig. 8. Educational Achievement of Children

normal-weight girls are accomplishing the most when considering all the girls. The standard deviations for Gi, Ge, and Gp are all below two, except the Gi; scores of the normal-weight and the under-weight boys. On the whole, nearly all the standard deviations show a close approximation of scores to the average in 68 per cent of the cases of these groups.

When the total groups are considered, regardless of sex, in terms of the differences of the means showing a difference more likely than chance (at least three times the probable error), the following are significant: (1) the over-weight group is superior to the normal-weight and under-weight groups in reading ability; (2) the over-weight group is more superior to the under-weight group in spelling ability; (3) the over-weight group excels the normal-weight and under-weight groups in arithmetic achievement; (4) educational achievement based upon the composite of (1), (2), and (3) above indicates the over-weight group achieve most when compared to the normal-weight and under-weight groups; (5) the Gi results indicate the over-weight group have a higher mental age for grade than the normal-weight group; (6) the Gp or grade progress or accomplishment index for mental age indicates the over-weight group is more superior when all three body-weight groups are considered.

SUMMARY

1. The results of the measurement of intelligence by the Stanford-Binet Test indicated that body-weight had little to do with the possession of certain degrees of intelligence. The only significant difference occurred in the comparison of the mental age means of the over-weight and normal-weight groups, which difference was slightly in favor of the over-weight group.

2. Educational achievement was measured by the Thorndike-McCall Reading Test, Form 7; the Morrison-McCall Spelling Test, List 1; and by the Woody-McCall Arithmetic Test, Form III. The results were reduced to a common comparative basis by the use of the McCall G scores, which are based on the McCall T scale. The achievement differences of the total body-weight groups showed the following which were more than chance differences as indicated by the differences of the means which were at least three times the probable errors: (1) the over-weight group achieved most when compared to the normal-weight and under-weight groups, as indicated by the Ge or composite arithmetic, reading, and spelling results; (2) the Gi results indicated that the over-weight group had a higher grade mental age than the normal-weight group; (3) the Gp results indicated that the over-weight group had the highest accomplishment index for mental age when all three body-weight groups were considered.

CHAPTER VIII

TESTS OF WILL-TEMPERAMENT, EMOTION, SOCIAL PERCEPTION, AND PERSONAL DATA

Tests of personality traits were selected that were best adapted to group testing. All the selected tests, because of their newness, are still in the process of establishing their reliability and validity. These tests were used, nevertheless, because data such as these were wanted, and, though they are not as reliable as may be desired, they are more objective than volunteered information by parents and teachers.

WILL-TEMPERAMENT

The Downey Will-Temperament Test has as its underlying conception that the fundamental behavior patterns are revealed in certain skilled motor performances, such as hand-writing, by the expression of certain subtle muscle twitches and in delicate expansions and contractions. Three variables are recognized in the test as revealing the amount of available energy, namely, the speed of reactions, the forcefulness and decisiveness of reactions, and the persistence or care with which the reactions are made. The results appear in Table XXX for each test and for each group.

The data from Table XXX are summarized for the four tests of each of the three variables showing the most significant differences, as indicated when the differences of the means are at least three times the probable errors. The summary follows:

1. *Speed of Reaction*

A. Speed of movement as measured by the average time taken in two trials to write "United States of America". The subject is instructed to write in his usual speed and in his usual style. (Result: the over-weight group has greater speed of movement than the under-weight group).

B. Freedom from load as measured by the ratio of natural

TABLE

WILL—TEM-

(As measured by the Downey

Sex Groups	A. Speed of Movement		B. Freedom from Load		C. Flexibility		D. Speed of Decision		E. Motor Impulsion	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Over-weight Boys ..	2.81	2.44	7.54	3.28	3.94	1.97	6.44	2.90	5.88	1.84
Over-weight Girls ..	2.94	2.35	7.15	3.58	3.42	1.83	5.04	2.61	5.49	1.97
Normal-weight Boys	2.31	2.16	6.81	3.53	3.52	1.89	5.35	2.77	5.43	1.59
Normal-weight Girls	2.48	1.96	7.58	3.19	3.27	1.79	5.06	2.48	5.71	1.78
Under-weight Boys .	2.09	1.24	5.54	3.86	3.64	1.94	5.27	2.28	5.46	2.00
Under-weight Girls .	2.27	1.40	6.46	3.59	3.58	1.67	4.87	2.35	5.48	1.94

Tests	Total Groups	Mean	S.D.	Diff. of Means	$P.E._{dM}$
A. Speed of Movement	Under-weight	2.18	1.32	.21	.16
	Normal-weight	2.39	2.06		
	Normal-weight	2.39	2.06	.47	.21
	Over-weight	2.86	2.39		
	Under-weight	2.18	1.32	.68	.18
	Over-weight	2.86	2.39		
B. Freedom from Load	Under-weight	6.00	3.75	1.19	.34
	Normal-weight	7.19	3.39		
	Normal-weight	7.19	3.39	.15	.32
	Over-weight	7.34	3.44		
	Under-weight	6.00	3.75	1.34	.34
	Over-weight	7.34	3.44		
C. Flexibility	Under-weight	3.61	1.81	.22	.17
	Normal-weight	3.39	1.84		
	Normal-weight	3.39	1.84	.29	.18
	Over-weight	3.68	1.92		
	Under-weight	3.61	1.81	.07	...
	Over-weight	3.68	1.92		
D. Speed of Decision	Under-weight	5.07	2.33	.13	.23
	Normal-weight	5.20	2.63		
	Normal-weight	5.20	2.63	.54	.26
	Over-weight	5.74	2.84		
	Under-weight	5.07	2.33	.67	.24
	Over-weight	5.74	2.84		
E. Motor Impulsion	Under-weight	5.47	1.97	.10	.17
	Normal-weight	5.57	1.70		
	Normal-weight	5.57	1.70	.11	.17
	Over-weight	5.68	1.92		
	Under-weight	5.47	1.97	.21	.18
	Over-weight	5.68	1.92		
F. Self-Confidence	Under-weight	5.18	3.12	1.18	.31
	Normal-weight	6.36	3.43		
	Normal-weight	6.36	3.43	.43	.32
	Over-weight	6.79	3.34		
	Under-weight	5.18	3.12	1.61	.30
	Over-weight	6.79	3.34		

speed of handwriting to fastest speed. (Result: the over-weight and normal-weight groups experience freedom from load more than the under-weight group).

C. Flexibility as measured by the degree of success in dis-

XXX

PERAMENT

Will-Temperament Test)

F. Self-Confidence		G. Non-Compliance		I. Motor-Inhibition		J. Interest in Detail		K. Coördination of Impulses		L. Volitional Perseveration	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
7.33	3.24	5.89	3.48	3.50	2.12	3.48	1.95	2.23	1.52	4.40	2.92
6.25	3.35	5.44	3.03	3.33	1.97	3.58	2.30	2.37	1.66	7.93	2.99
6.33	3.52	6.42	3.58	3.56	2.71	3.02	2.14	1.75	0.65	4.70	3.08
6.40	3.34	5.83	3.17	2.94	2.25	3.65	2.12	2.12	1.40	7.58	3.11
4.90	3.32	4.98	3.28	3.06	1.94	3.62	1.90	2.13	1.53	5.56	2.99
5.46	2.88	4.90	2.98	3.42	2.56	3.42	2.03	2.46	1.81	7.27	2.92

Tests	Total Groups	Mean	S.D.	Diff. of Means	P.E.$_{dM}$
G. Non-Compliance	Under-weight	4.94	3.13	1.18	.31
	Normal-weight	6.12	3.40		
	Normal-weight	6.12	3.40	.45	.31
	Over-weight	5.67	3.27		
	Under-weight	4.94	3.13	.73	.30
	Over-weight	5.67	3.27		
I. Motor Inhibition	Under-weight	3.24	2.28	.01	--
	Normal-weight	3.25	2.51		
	Normal-weight	3.25	2.51	.16	.22
	Over-weight	3.41	2.05		
	Under-weight	3.24	2.28	.17	.20
	Over-weight	3.41	2.05		
J. Interest in Detail	Under-weight	3.52	1.97	.18	.19
	Normal-weight	3.34	2.16		
	Normal-weight	3.34	2.16	.19	.20
	Over-weight	3.53	2.13		
	Under-weight	3.52	1.97	.01	--
	Over-weight	3.53	2.13		
K. Coördination of Impulses	Under-weight	2.32	1.69	.39	.13
	Normal-weight	1.93	1.11		
	Normal-weight	1.93	1.11	.37	.13
	Over-weight	2.30	1.60		
	Under-weight	2.32	1.69	.02	--
	Over-weight	2.30	1.60		
L. Volitional Perseveration	Under-weight	6.42	3.07	.24	.31
	Normal-weight	6.18	3.41		
	Normal-weight	6.18	3.41	.03	--
	Over-weight	6.21	3.42		
	Under-weight	6.42	3.07	.21	.31
	Over-weight	6.21	3.42		

guising handwriting and by speed and success in copying a model of the phrase "United States of America". (Result: all three groups are more alike than different in this trait.)

D. Speed of decision as measured by the time taken to check certain character traits which the subject thinks he possesses. (Result: all three groups are equally quick in making decisions.)

2. *Forcefulness and Decisiveness of Reaction (Aggressiveness)*

E. Motor impulsion as measured by writing the signature in four ways: usual style and speed with eyes closed, the eyes open but counting by 3's aloud, eyes closed but counting by 3's aloud, and eyes closed but counting by 2's aloud, while the examiner taps with a pencil. The score is based upon changes in size and speed of writing under distractions. (Result: no significant differences appear when the three groups are compared.)

F. Self-confidence as measured by asking the subject to underline false and true after each of the 16 sentences (in reference to a previously read list of words); then he is told that if he is absolutely sure that he is right he is to draw two lines under true or false instead of one. The score depends upon the numbers of items doubly underlined. (Result: the over-weight and normal-weight groups have more self-confidence than the under-weight group).

G. Reaction to contradiction or suggestibility or non-compliance as measured by the subject being told after he has marked the 16 sentences that eight are true and eight are false and that he may circle all those he wishes to change. The score is the degree to which he sticks to his original decision. (Result: the normal-weight group is less suggestible than the under-weight group.)

3. *Carefulness and Persistency of Reaction*

I. Motor inhibition as tested by the time of retarded handwriting when writing the phrase "United States of America" as slowly as he can. The score is the average of three trials. (Result: all comparative differences are negligible.)

J. Interest in detail as measured by the exactness with which a model is copied when he is told to be as exact as possible, and when he is told to do as well as possible and choose his own speed. The score is the relative time taken and the exactness achieved. (Result: all groups are about equally interested in detail.)

K. Coördination of impulses as measured by the degree of success achieved and the time taken in writing "United States of America" in a very narrow space. (Result: the differences noted are insignificant.)

L. Volitional perseveration as measured by the time taken in working out a disguised hand. The subject is told to write "United States of America" in such a disguised way that even an expert could not detect it. (Result: all three groups are about equally persevering.)

To conclude, when total body-weight groups are compared as to will-temperament traits the three groups seem more alike than different, with the following exceptions: (1) the over-weight group has greater "speed of movement" than the under-weight group; (2) the over-weight and normal-weight groups surpass the under-weight group in experiencing more "freedom from load" and "self-confidence"; (3) the under-weight group is more suggestible than the normal-weight group as it reacts to contradiction more easily.

EMOTIONAL STABILITY

The form of the Woodworth-Matthews [77] personal data questionnaire designed for obtaining a measurement of the general emotionality, nervous and mental stability of pre-adolescents, was used.

The subject matter of the questions was classified for this study as follows since a total score for each child was thought less interesting:

Subject Matter

I. Fears, worries, perseveration of ideas; and the like.
    Questions 8, 9, 10, 11, 12, 13, 14, 15, 66, 67, 68, 69, 70.
II. Physical symptoms, pains, weariness, and incoördinations.
    Questions 21, 22, 24, 25, 26, 27, 28, 29, 35, 36, 37, 38, 46, 57, 72, 75.
III. Unhappiness, unsocial and anti-social moods, and the like.
    Questions 1, 2, 3, 4, 5, 6, 7, 30, 31, 32, 33, 34, 39, 40, 41, 42, 43, 44, 45, 58, 59, 71, 72.
IV. Dreams, phantasies, sleep disturbances, and the like.
    Questions 16, 17, 18, 19, 20, 60, 61, 62, 63, 64, 65, 73, 74.

The results of the several body-weight group reactions appear in Table XXXI.

TABLE XXXI

EMOTIONAL STABILITY

(As measured by the Woodworth-Matthews Personal Data Questionnaire and expressed here as the average of the total responses in percentages for each body-weight group)

	I Fear, Worries, etc.	II Pains, Weariness, etc.	III Unhappiness, etc.	IV Dreams, Phantasies, etc.
Over-weight Boys	88.0	79.7	84.4	79.1
Over-weight Girls	91.6	79.5	87.0	73.3
Normal-weight Boys	83.7	79.7	85.5	73.0
Normal-weight Girls	84.5	78.7	79.4	73.7
Under-weight Boys	84.1	84.9	84.0	83.3
Under-weight Girls	85.9	81.0	86.5	76.6

From the percentages above it might be said that the over-weight boys and girls have the greatest tendency to fears and worries of all the body-weight groups considered. The under-weight group has the greatest tendency to pains, weariness, and other physical symptoms. The normal-weight boys are the most unhappy (but all boy groups are about the same in this tendency), while the over-weight girls and the under-weight girls are the unhappiest groups of girls. The under-weight group has the greatest tendency to dreams, phantasies, and sleep disturbances of all the groups considered.

SOCIAL PERCEPTION

The Gates [42] Social Perception Test[1] consists of a series of ten pictures expressing the following emotions: Picture 1 expresses laughter, joy, amusement; Picture 2 represents defiance or anger; Picture 3 shows fear or horror; Picture 4 represents surprise, amazement, wonder; Picture 5 shows scorn, contempt, disdain; Picture 6 expresses pain; Picture 7 expresses surprise or awe; Picture 8 represents defiance, stubbornness, indignation; Picture 9 shows appeal, love and tenderness; Picture 10 represents smiling through tears suggesting reconciliation. One point is given for each correct interpretation of these ten pictures. The questions asked for each one are: "What is the lady doing?" "What is she thinking about?" "How does she feel?" One minute for each picture is given in which to take the picture out of the envelope and to answer the three questions.

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[1] Acknowledgment and thanks are here made to Dr. G. S. Gates, of Barnard College, for permission to use this test.

TABLE XXXII

SOCIAL PERCEPTION

(As measured by the Gates Social Perception Test)

Sex Groups	Means	Standard Deviation
Over-weight Boys	7.17	1.27
Over-weight Girls	5.92	1.81
Normal-weight Boys	6.46	1.85
Normal-weight Girls	6.50	1.81
Under-weight Boys	6.74	1.98
Under-weight Girls	6.52	1.80

Total Groups	Means	S. D.	Diff. of Means	P. E.$_{dM}$
Under-weight Group	6.63	1.99	.14	.18
Normal-weight Group	6.49	1.83		
Normal-weight Group	6.49	1.83	.05	.17
Over-weight Group	6.54	1.69		
Under-weight Group	6.63	1.99	.09	.18
Over-weight Group	6.54	1.69		

The results for the three body-weight groups appear in Table XXXII.

According to the differences in Table XXXII all three groups are about equally socially mature. The reliability of the test, however, is not yet established and the groups are highly selected, each of which factors might be responsible for these results.

PERSONAL DATA

A questionnaire in six parts, as shown in the accompanying form, was given to all the children. Each question was explained, if the concepts or words were not understood, to the body-weight groups for whom the questions were intended. The summary is given in terms of total percentages of positive responses to each question for the boys and for the girls of each body-weight group, along with the group differences when they were as much as 10 per cent. The items in the summary are too numerous to discuss, so only those responses which show significant and interesting differences for group comparisons will be mentioned.

PERSONAL DATA SHEET

(*Responses in Percentages*)

PART I UNDERLINE THE RIGHT ANSWER			POSITIVE RESPONSES						GROUP DIFFERENCES					
			Boys			Girls			Boys			Girls		
			O*	N	U	O	N	U	UN	NO	UO	UN	NO	UO
1. Do you have to be coaxed into play, games, exercise?	Yes	No	9	8	11	5	2	5						
2. Are you rough or cruel when you play?	Yes	No	7	12	11	--	7	5						
3. Are you mindful of the rights of others?	Yes	No	84	18	72	83	88	91	54	66	12			
4. Do you like to play with children of your own age?	Yes	No	95	83	92	98	91	95		12				
5. Do you like to play with younger children?	Yes	No	31	36	47	80	48	46	11				32	34
6. Do you like to play with older children?	Yes	No	65	58	72	48	54	54	14					
7. Would you rather loaf than play?	Yes	No	24	10	11	--	6	5			13			
8. Would you like to eat a great deal of candy, if you could get it?	Yes	No	45	38	50	37	35	39	12					
9. Do you eat many potatoes each day?	Yes	No	48	50	53	38	48	70				22	10	32
10. Do you like potatoes to eat very much?	Yes	No	64	65	78	36	69	76	13				33	40
11. Do you like butter?	Yes	No	78	74	86	58	86	81	12				24	23
12. Do you eat much butter on things?	Yes	No	58	72	83	49	75	76	11	14	25		26	27
13. Do you like ice cream very much?	Yes	No	80	80	82	64	66	76				10		12
14. Do you eat much ice cream?	Yes	No	50	45	53	43	45	55				10		12
15. Do you like pastry, as pie and cake?	Yes	No	74	23	64	67	76	62	41	51	10	14		
16. Do you eat much pastry, as pie and cake?	Yes	No	50	40	77	38	30	40	37	10	27	10		
17. Do you find it hard to give up candy?	Yes	No	42	46	60	37	30	38	14		18			
18. Did you ever have to give it up?	Yes	No	38	10	53	44	30	48	43	28	15	18	14	
19. Did you ever have to give up eating potatoes?	Yes	No	32	22	86	27	7	28	64	10	54	21	20	
20. Did you find it hard?	Yes	No	8	24	92	15	13	6	68	16	84			
21. Did you ever have to give up eating butter?	Yes	No	33	17	92	24	9	8	75	16	59		15	16
22. Did you find it hard?	Yes	No	32	21	92	15	14	10	71	11	60			
23. Did you ever have to give up eating desserts?	Yes	No	37	40	25	29	14	22	15		12		15	

*O = Over-weight N = Normal-weight U = Under-weight

24. Did you find it hard to do?	Yes	No	42	35	28	23	24	15						
25. Did you ever have to give up eating cereals?	Yes	No	18	18	20	17	11	3						14
26. Did you find it hard?	Yes	No	15	25	13	21	14	10	12	10				11
27. Do you eat each meal until you feel stuffed?	Yes	No	23	32	25	46	20	19					26	27
28. Do you have more than one helping of foods you like?	Yes	No	70	66	54	63	78	67	12		16	11	15	
29. Do you take naps during the day or evening?	Yes	No	16	25	43	17	22	17	18		27			
30. Are you considered lazy?	Yes	No	20	17	14	17	2	11					15	
31. Do you like very much to be praised?	Yes	No	43	49	47	47	51	47						
32. Do you dislike very much to be blamed for things?	Yes	No	76	80	61	80	70	57	19		15	13	10	23
33. Are you worried until you get your work done?	Yes	No	60	59	74	65	59	54			14			11
34. Do you always do your duty as homework, etc.?	Yes	No	83	82	78	80	93	92					13	12
35. Do you play much at home after school?	Yes	No	66	61	74	60	61	75	13			14		15
36. Do you walk gracefully?	Yes	No	39	54	47	59	62	88		15		26		29
37. Do you walk easily?	Yes	No	95	87	95	90	100	94					10	
38. Are you awkward?	Yes	No	21	21	14	14	7	12						
39. Do you bump into many things often?	Yes	No	14	13	3	10	7	19	10		11	12		
40. Do you fall often?	Yes	No	14	21	14	10	7	6						
41. Do you fall up steps often?	Yes	No	15	13	17	8	2	12				10		
42. Do you have any black and blue marks on your body now?	Yes	No	38	41	30	15	21	19	11					
43. Do you have any scratches now?	Yes	No	50	47	50	12	33	11				22	21	
44. Do you have any cuts now?	Yes	No	24	29	25	5	14	20						15
45. Do you black and blue easily?	Yes	No	40	33	26	31	26	44			14	18		13
46. Do you play as much as two hours without getting tired?	Yes	No	65	69	78	62	69	75			13			13
47. Do you study as much as an hour without getting tired?	Yes	No	59	53	64	62	54	67	11			13		
48. Can you run two blocks without getting tired?	Yes	No	52	79	75	69	68	69		27	23			
49. Are you active most of the day?	Yes	No	74	81	89	83	85	94			15			11
50. Do you sit down most of the day outside of school?	Yes	No	12	10	92	24	13	8	82		80		11	16
51. Do you eat fast?	Yes	No	45	41	59	31	33	19	18		14	14		12
52. Do you eat between meals?	Yes	No	61	61	70	54	60	65						11
53. Do you drink coffee each day?	Yes	No	30	38	36	24	20	8				12		16
54. Do you drink tea each day?	Yes	No	23	13	28	24	11	11	15	10			13	13
55. Do you eat some candy each day?	Yes	No	43	61	47	51	65	63	14	18			14	12
56. Do you ride some place each day?	Yes	No	40	46	28	34	24	19	18		12		10	15
57. Do you stay outdoors each day?	Yes	No	82	73	78	83	76	72						11
58. Do you take a walk each day?	Yes	No	82	68	81	76	61	67	13				15	

PERSONAL DATA SHEET (*Continued*)

(*Responses in Percentages*)

Part I Underline the Right Answer			Positive Responses						Group Differences					
			Boys			Girls			Boys			Girls		
			O	N	U	O	N	U	UN	NO	UO	UN	NO	UO
59. Do you sleep at least eight hours each night?	Yes	No	88	82	100	90	88	94	18		12			
60. Are you hungry in two hours after you eat a meal?	Yes	No	16	27	28	25	26	23			12			
61. Do you suffer from hunger then if you do not eat?	Yes	No	31	36	50	39	31	29	14		19			10
62. Do you think you get enough to eat?	Yes	No	86	95	92	100	88	94					12	
63. Do you think you eat often enough?	Yes	No	79	82	92	95	88	88	10		13			
64. Do you think you get enough sleep?	Yes	No	67	73	86	78	81	77	13					
65. Do you suffer from not getting enough sleep?	Yes	No	36	19	17	27	12	16		17	19		15	11
66. Do you get short of breath after running or climbing?	Yes	No	48	32	25	37	40	31		16	23			
67. Do you feel your heart beat or thump after meals?	Yes	No	14	3	5	76	7	6		11			69	70
68. Does your skin ever turn blue, as around your lips?	Yes	No	9	19	8	5	9	11	11	10				
69. Do you have difficulty in walking?	Yes	No	5	30	8	2	2	3	22	25				
70. Do you have difficulty in running?	Yes	No	19	11	14	5	9	8						
71. Are your upper legs very large?	Yes	No	50	19	22	46	17	11		31	28		29	35
72. Do you perspire much?	Yes	No	56	34	17	39	17	25	17	22	39		22	14
73. Does your skin between the upper parts of your legs get sore from your legs rubbing?	Yes	No	27	8	19	33	17	11	11	19			16	22
74. Is the inner side of your right shoe heel worn off much usually?	Yes	No	17	14	17	17	7	11					10	
75. Is the inner side of your left shoe heel worn off much usually?	Yes	No	22	14	15	19	5	11					14	
76. Are your ankles weak?	Yes	No	15	20	14	15	14	25				11		10
77. Are you very neat?	Yes	No	76	73	66	80	75	83			10			
78. Are you sociable?	Yes	No	85	81	75	85	97	94			10		12	
79. Are you considered a good mixer?	Yes	No	79	76	84	71	86	78					15	
80. Do you cry easily?	Yes	No	31	26	47	35	33	54	21		16	21		19

81. Do you laugh easily?	Yes	No	83	79	91	83	91	91	12					
82. Do you like to confide in someone?	Yes	No	59	68	67	65	69	70						
83. Do you emphasize the good side of things when you do confide?	Yes	No	88	65	70	78	71	55		23	18	16		23
84. Do you exaggerate when relating things?	Yes	No	50	20	25	26	25	24		30	25			
85. Do you sometimes pity yourself?	Yes	No	45	55	50	47	43	37		10				10
86. Are you good natured?	Yes	No	83	71	81	10	90	89	10	12			10	11
87. Do you often lose your temper?	Yes	No	42	53	57	37	42	39		11	15			
88. Do you like sympathy?	Yes	No	58	59	76	62	79	76	17		18		17	14
89. Do you take pleasure in the success and enjoyment of others?	Yes	No	87	90	89	92	93	37				56		55
90. Do you obey parents, teachers, rules?	Yes	No	85	82	89	97	97	82				15		15
91. Do you follow advice?	Yes	No	71	77	92	83	90	26	15		21	64		57
92. Do you depend upon others for assistance?	Yes	No	30	32	48	29	25	60	16		18	35		31
93. Do you have a tendency to be the leader in your group?	Yes	No	65	46	69	50	69	88	23	19		19	19	38
94. Are you ambitious to be a great person some day?	Yes	No	85	89	94	75	78	33				45		42
95. Are you brave because you are big and fat?	Yes	No	35	34	18	53	25	33	16		17			20
96. Do you like to make others obey you?	Yes	No	29	40	57	57	52	65	17	17	28	13		
97. Do you like to plan your work?	Yes	No	88	78	82	94	84	86		10			10	
98. Are you systematic when you do?	Yes	No	73	76	64	74	69	58	12			11		16
99. Do you stay with your work until you finish?	Yes	No	90	83	89	85	76	2				74		83
100. Do you ever follow the leader?	Yes	No	85	86	86	82	90	94						12
101. Are you always on time?	Yes	No	78	71	77	74	93	73				20	19	
102. Do you talk much?	Yes	No	33	53	57	49	61	49		20	24	12	12	
103. Do you like quick and active sports?	Yes	No	88	82	94	88	97	6	12			91		82
104. Do you like dangerous sports (as swimming)?	Yes	No	93	92	73	75	81	83	19		20			
105. Do you like intellectual games (as cross-word puzzles)?	Yes	No	69	54	72	63	68	73	18	15				10
106. Are you cheerful?	Yes	No	90	92	94	98	90	94						
107. Are you kind?	Yes	No	93	84	85	98	95	97						
108. Are you considered easygoing?	Yes	No	71	68	79	69	70	70	11					
109. Are you stubborn, sulky or bad tempered?	Yes	No	27	36	71	15	18	30	35		44	12		15
110. Are you weak willed and so give in to your feelings easily?	Yes	No	21	40	79	13	22	15	39	19	58			
111. Do you ever feel weak and unable?	Yes	No	5	29	77	17	37	14	48	24	72	23	20	
112. Do you imitate other children's dress, manners, etc.?	Yes	No	17	26	18	13	25	20					12	
113. Do you have day dreams?	Yes	No	31	43	26	15	37	26	17	12		11	22	11

PART II (Italic initial letters indicate the most frequent responses)	Boys			Girls		
	O	N	U	O	N	U
1. When I am called nicknames like "fatty," "skinny," and the like, I am *angry* furious revengeful irritated jealous	A* 64		A 65	A 65		A 40
2. When I see someone who is quite thin or fat, I am *jealous* irritated *furious* angry	J 55		F 26 A 26	J 44		J 53
3. When someone says I am fat, or thin, I am *angry* furious irritated revengeful jealous	A 54		A 66	A 54		A 35
4. When others do not seem to like me, I am *worried*, melancholy *grieved* regretful	G 44	W 40	W 44	R 21	G 37	W 33
5. When others do not approve of the way I appear, I am *worried* melancholy *grieved* regretful	G 34	W 44	W 44	W 40	G 37	W 35
6. When I can't go to parties and the like. I am *anxious* *grieved* worried regretful *melancholy*	M 37	G 42	G 39	G 31	A 41	M 32
7. When others are invited and I am slighted, I am *grieved* melancholy worried anxious	G 44	G 63	G 65	G 34	G 54	M 31
8. When I am the only fat person or thin person at the party, or the like, I am self-conscious excited shocked *embarrassed* nervous	E 52		E 53	E 36		E 44
9. When I am with a group of thin or fat people, I am uneasy nervous excited *embarrassed*	E 48		U 44	U 44		U 46
10. When I see very, very fat people, I am *sympathetic* *amused* disgusted	S 58	A 44	A 46	S 50	S 55	S 52
11. When someone approves even slightly of me or what I do, I am *happy* elated indifferent enthusiastic	H 62	H 77	H 77	H 91	H 83	H 75
12. When things do not go along smoothly in work or play, I am *sulky* refuse to talk refuse to play pity myself	Su 63	Su 62	Su 63	Su 44	Su 49	Su 44
13. I like to meet fat characters in *movies* stories life athletics	M 59	M 59	M 59	M 60	M 70	M 69
14. I am not fat because of *overeating* lack of exercise eating sweets	O 43			O 52		

* Responses indicated by initial letter of corresponding word

15. I am fat because there were fat people in my family, as father mother grandfather grandmother	F 52			F 37		
16. I don't care to get too thin because thin people are unhappy ugly un-healthy inefficient	Uh 64	Uh 48	Uh 69	Uh 70	Uh 72	Uh 93
17. In order not to look so fat or thin and conspicuous, I try to be neat dignified well mannered a leader	N 77		N 47	N 60		N 57
18. Because I am so big and fat, or so very thin, I don't like to look conspicuous, so I don't wear such colors, if I can help it, as red orange yellow bright green	R 57		R 40	R 31		R 36
19. Because I am so fat, or so thin, I feel that I look better in shoes that are plain low-heeled black	P 68		P 36	P 41		Y 36 P 72
20. Because I am so fat, or so thin, I don't like to appear in a swimming suit sing before a group speak before a group do dramatics	SS 55		B 36 SS 31	SS 50		SS 70
21. Because I am so fat, or so thin, I don't like to dance walk run do gymnasium work	D 70		D 70	D 38		D 62
22. Because I am so fat, or so thin, I don't like to meet strangers go to parties to eat with guests	S 53		P 46	S 46		S 64

	O-B			O-G			N-B			N-G			U-B			U-G		
PART III	f	t	nw	f	t	nw	f	t	nw	f	t	nw	f	t	nw	f	t	nw
1. Is your father fat, thin, or normal-weight?	21	12	66	22	2	74	17	8	72	35	13	52	24	13	63	0	23	77
2. Is your mother fat, thin, or normal-weight?	26	6	68	24	9	66	13	9	78	24	10	66	18	16	66	13	17	70
3. Do you think you are fat, thin, or normal-weight?	75	3	22	5	2	93	0	56	44	76	2	22	4	12	34	15	61	24
4. Do you want to be fat, thin, or normal-weight?	4	4	91	7	5	88	2	11	87	8	4	88	4	10	86	0	14	84
5. Are you willing to give up sweets, bread, and the like to become or remain so?	+ 73	− 27		+ 72	− 28		+ 58	− 42		+ 74	− 26		+ 68	− 32		+ 60	− 40	

BEHAVIOR IN PLAY

In items of play activities the following reactions were noted: (1) about 54 per cent more under-weight and 66 per cent more over-weight than normal-weight boys feel that they are alert to the rights of other; (2) about 12 per cent more over-weight than normal-weight boys like to play with children of their own age; (3) about 11 per cent more under-weight than normal-weight boys like to play with younger children and 32 per cent more over-weight than normal-weight girls as well as 34 per cent more over-weight than under-weight girls; (4) about 14 per cent more under-weight than normal-weight boys like to play with older children; (5) 13 per cent more over-weight than under-weight boys would rather loaf than play.

More under-weight children than over-weight children can play as much as two hours without getting tired. More normal-weight and under-weight than over-weight boys can run two blocks without getting tired. The over-weight boys feel more short of breath after running or climbing than the other boys. The under-weight children are more active most of the day than the over-weight children. The under-weight boys and the over-weight girls sit down most of the day outside of school. The normal-weight and over-weight girls like quick and active sports better than the under-weight girls; the over-weight boys like dangerous sports, as swimming, better than the other boys. The under-weight and over-weight boys like intellectual games, as puzzles, better than the normal-weight boys.

FOOD DESIRES AND HABITS

More under-weight (12%) than normal-weight boys would like to have a great deal of candy to eat. More under-weight (22%) than normal-weight girls and more under-weight (32%) than over-weight girls eat many potatoes each day; more under-weight (13%) than normal-weight boys and more normal-weight (33%) than over-weight girls as well as more under-weight (40%) than normal-weight girls like potatoes very much. More under-weight (12%) than normal-weight boys and more normal-weight (24%) than over-weight girls like butter; more under-weight (25%) than over-weight boys and more under-weight (27%) than over-weight girls eat a great deal of butter on food articles. The under-weight girls like and eat more ice-cream than the normal-weight or over-weight girls. More over-weight boys than normal-weight boys like pastry (as pie and cake) but more under-weight boys than over-weight boys eat it. More under-weight boys than over-weight boys find it difficult to give up candy, potatoes, and butter, but the opposite is true where desserts are concerned.

The over-weight girls when compared to the normal-weight and under-weight girls eat each meal until they feel stuffed; more over-weight than under-weight boys have more than one helping of pleasing foods, while more normal-weight than over-weight girls have this habit. More under-weight than over-weight boys and more over-weight than under-weight girls eat rapidly, the same group differences holding for eating between meals; and more under-weight than over-weight boys are hungry two hours after they eat and suffer if they do not eat.

NICKNAMES

The over-weight boys gave the nicknames that are associated with their body-weight as indicated in the following summary of percentages: "Fat" (22), "Fatty" (22), "Tub" (12), "Skinny" (2), "Big Boy" (2), and "Boots" (2); the over-weight girls gave in frequency: "Fat" (30), "Fatty" (40), and "Skinny" (5). The normal-weight boys gave: "Skin" (6), while all the other names were condensations of their own names or friendly pet names; the normal-weight girls gave: "Shrimp" (2), "Fatty" (2), "Fat" (2), and "Skinny" (2). The under-weight boys had the frequency: "Skinny" (16), "Fat" (5), "Shorty" (1); the under-weight girls gave: "Skin" (20), "Slim" (2), "Shrimp" (2), "Fat" (2), and "Tooth-pick" (2).

The over-weight group seems to be called many more nicknames than the under-weight group, when percentages of frequency are considered.

CONSCIOUSNESS OF BODY-WEIGHT CONDITIONS

More normal-weight than over-weight boys and more under-weight than normal-weight and over-weight girls feel that they walk gracefully. More over-weight than under-weight boys and more under-weight than normal-weight girls feel that they bump into things often.

There is consciousness on the part of the total over-weight group as regards such conditions as large and massive thighs, much perspiration, mascerated skin from folding, and intertrigo.

More under-weight boys and over-weight girls pity themselves than do the other body-weight groups. The over-weight group indicates that it feels brave because of body size. The under-weight boys indicate that they often feel weak and incompetent.

To the fourth and fifth questions asked in Part III of the Personal Data Sheet, 91 per cent of the over-weight boys and 88 per cent of the girls and 87 per cent of the under-weight boys and 84 per cent of the under-weight girls wished to be normal-weight. When asked why they wished to become so, the following responses in percentages were most frequent for the over-weight boys: play better (13), health (7), look better (7), because of nicknames (4); the over-weight girls gave: look better (4), healthier (34), can play more (6), hate nicknames (9); the under-weight boys gave: play more (37), feel healthier (32), look better (23); and the under-weight girls gave: look better (55), healthier (35), play more (10).

The question was then asked, "Are you willing to give up, if you are fat, certain foods as sweets, and if you are thin are you willing to eat more food?" The replies for two groups are as follows in percentages of positive and negative answers:

	Yes	No
Over-weight Boys	**73**	**27**
Over-weight Girls	**74**	**26**
Under-weight Boys	**58**	**42**
Under-weight Girls	**60**	**40**

The replies to this question seem to indicate more consciousness on the part of the over-weight group of their condition and an inclination to be willing to correct it.

SUMMARY

1. Speed of reaction tests within the Downey Will-Temperament Test showed the over-weight group was higher in speed of movement than the under-weight group, both the over-weight and normal-weight groups surpassed the under-weight groups in experiencing more "freedom from load" and "self-confidence". The under-weight group was more suggestible than the normal-weight group, as it reacted to contradiction more easily.

2. The Woodworth-Matthews Emotional Test was given and results as expressed in average percentages of the total responses showed the following: (1) both the over-weight boys and girls had the greatest tendency to fears and worries; (2) the under-weight group had the greatest inclination to pains, weariness and other physical symptoms; (3) the boys of all weight groups were about equal in the tendency to unhappiness while the over-weight girls and under-weight girls were the unhappiest groups of girls; (4) the under-weight group, as a whole, had the greatest tendency to dreams, phantasies, and other sleep disturbances.

3. Considering the results found for the Gates Social Perception Test, all three body-weights did about equally well, but the unreliability of the test and the highly selected nature of these groups probably prevent the results from having significance.

4. The personal data questionnaire results were too numerous to repeat here, but many interesting and significant group differences were indicated which suggest as problems the moral, physical, mental hygienic, and the aesthetic aspects of body-weight.

CHAPTER IX

COMPARATIVE INTERESTS

The data on interests were secured from the following sources: (1) results of a play interest and practice test devised by Terman*; (2) Wyman's intellectual, social, and activity interest association test*; (3) a similar association test devised for associations with body-weight; and (4) a questionnaire to obtain general and popular interest reactions.

THE PLAY INTEREST AND PRACTICE TESTS

The subject matter content of the Terman Play Interests and Practice Test [115] was used. Slight changes were made in the directions and a different scheme for scoring and recording the responses was used. The accompanying sheet gives the form as it was finally arranged (Exercises 1-5); the exercises are copies of Terman's original subject matter, but the directions assigned to each exercise are slightly different from the original with only one very great change, namely, when Exercise 3 was cut in two and the second half called Exercise 4 (a division of subject matter was put directly beneath it). Changes in the original form were made only for the reason that a briefer form and procedure was desired. Responses were recorded and are to be seen summarized as attached to the rearranged form of the test on the accompanying sheet, responses are totaled in percentages showing only the highest total response for each of the items. The tabulated data attached to the form outline reads in this way: 100 per cent of the under-weight boys put one cross before item 1 in group I for having played at "roll hoops"; 39 per cent of normal-weight girls put two crosses before "roll hoops," which indicates that they think they can do this very well; and so on for each answer to the questions for Exercises 2 and 3 with the item "roll hoops". Then the same procedure is followed for "play jackstones", for "spin tops", and so on. Exercise 5 is read by noting the summary of percentages for the total positive replies; that is, 72 per cent for the over-weight boys indicates the per centage of the total number of over-weight boys who have "caught a fish," and so on.

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*Quoted and used with permission of the authors to whom appreciative thanks are extended.

Then all five parts were summarized to find the percentages of each group that indulge in the games, plays, and amusements as classified. The Terman classification summarizes all games, plays, and amusements into a threefold arrangement or into three groups, as described by the nature of the activity; these three types of play activities are: (1) the "active-solitary" class which includes those games which are fairly active and usually or frequently performed alone, as spinning tops, riding a bicycle, etc.; (2) the "social-active" games are those which are social and usually, but not always, competitive, as hide and seek, tag, baseball, etc.; (3) games whch are "mildly social but relatively quiet" are those which make less demand upon physical strength and skill than upon powers of logical thought, as cards, dominoes, etc.

The summary of Exercises 1-5 arranged according to item numbers for this classification is as follows:

A		B		C	
ACTIVE-SOLITARY		SOCIAL-ACTIVE		MILDLY SOCIAL BUT RELATIVELY QUIET	
Group	Items	Group	Items	Group	Items
I	1, 3, 5	III	4	I	2, 4
II	1, 2, 3, 4, 5	VI	1, 2, 3, 4, 5	V	1, 3
III	1, 2, 3, 5	VII	1, 3, 4, 5	IX	1
IV	1, 2, 3, 4, 5	VIII	1, 2, 3, 4, 5	XI	4
V	2, 4, 5	IX	2, 3, 4, 5		
VII	2	X	1, 2, 3, 5		
X	4	XI	1, 2, 3		
XI	5	XII	1, 2, 3, 4, 5		

The summary of activities preferred by each body-weight group is expressed in percentages in Table XXXIII.

TABLE XXXIII

TERMAN PLAY INTERESTS TEST

(Percentage Totals)

EXERCISES 1, 2, 3 AND 4

	ACTIVE-SOLITARY			ACTIVE-SOCIAL			MILDLY SOCIAL BUT RELATIVELY QUIET		
	O*	N	U	O	N	U	O	N	U
Boys	27	36	36	33	41	43	3	7	8
Girls	46	40	38	37	38	40	10	10	9
Total	73	76	74	70	79	83	13	17	14

* O = Over-weight. N = Normal-weight. U = Under-weight.

TERMAN PLAY INTERESTS AND PRACTICE TEST

(With slight changes)

Exercise 1

First, put One Cross (x) on the line *before* each thing you Have Ever Done or Played
Next, put Two Crosses (xx) *before* each thing you Can Do or Play Very Well

Exercise 2

Put One Cross (x) *behind* each thing you Like To Do Or Play
Put Two Crosses (xx) *behind* each thing you Like Very Well

Exercise 3

Put the Number 1 *before* each thing you do Once or Twice a Month
Put the Number 2 *before* each thing you do Once or Twice a Week
Put the Number 3 *before* each thing you do Nearly Every Day

	X Before		XX Before		X After		XX After		1		2		3	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
I. Begin Here:														
1. . . . . . . Roll hoops	U 100			N 39		U 88	N 100		N 100	N 100		U 50		
2. . . . . . . Play jackstones	U 100			O 49	U 100		U 100			N 81	U 22			O 16
3. . . . . . . Spin tops	U 82		N 63		U 100		U 100		U 66 N 66	U 66		U 34	N 33	
4. . . . . . . Play jackstraws		O 81	N 45		O 100			N 80	N 100 U 100	N 100		N 28		O 9
5. . . . . . . Walk on stilts		O 100	O 33 N 33		U 100		U 100		N 100 U 100	U 100	O 8			O 10

II. 1. ...... Fly kites	U 86		N 58		U 80			N 80	U 100	O 100 U 100 N 100	O 33			O 25
2. ...... Play with bow and arrow		O 83	N 50			U 100	O 66	N 66				U 50	N 20	
3. ...... Coast or toboggan		O 71	N 78			O 88	N 75		U 66			N 100		U 42
4. ...... Ride bicycle		O 65	O 60		U 40		N 88		U 86		N 62		O 72	
5. ...... Skate		U 45	O 71 N 71			O 72 U 72	N 92		U 46			O 52		N 50
III. 1. ...... Ski		O 100	O 75		U 100	U 100	O 100			U 100 N 100		O 100	N 50	
2. ...... Hike	U 73		U 73		U 75		N 77		U 84			N 100		O 25
3. ...... Do garden work		U 77	N 72		U 100			N 100	U 100 N 100				O 50	N 50
4. ...... Dance	U 94			N 69	U 100		N 100		U 66		N 44			N 59
5. ...... Shoot		N 100	O 55			O 100 U 100	N 100	N 100	N 100	O 100 N 100	O 33			N 50
IV. 1. ...... Fish	U 75		N 52		U 66		N 88		U 100	N 100 U 100		O 33	N 43	
2. ...... Swim	U 82		O 68			U 47	N 100		U 62		N 50			U 66
3. ...... Ride horseback		O 77		N 63		O 75 U 75		O 86	N 75	O 75		N 100		U 50

TERMAN PLAY INTERESTS AND PRACTICE TEST (*Continued*)

	X Before		XX Before		X After		XX After		1		2		3	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
IV. 4. ...... Row a boat		O 66	N 60			U 60		N 100		O 66		N 66	N 60	
5. ...... Hunt		O 100	O 66		O 100	O 100 U 100	N 57			O 100 N 100 U 100	O 10			O 90
V. 1. ...... Do plain sewing		U 61		N 50		U 73		O 67		O 29		N 75	O 75	O 29
2. ...... Cook a meal	U 75				O 100			N 66	U 100			U 34		
3. ...... Knit, crochet or do fancy work		U 59		O 54		O 56		N 50 U 50		U 80		N 54		O 18
4. ...... Use tools		N 86 O 86		O 45		N 66 U 66	N 100			O 100	N 47			U 56
5. ...... Work with machinery		O 100		O 53 U 54	N 50	O 50 U 50	N 100	N 100		O 100		N 100	O 50	
VI. 1. ...... Play tag	U 60			O 60		O 61	N 64			O 48		O 38	U 50	
2. ...... Ring around the rosy	U 90			O 53	N 100		O 100		U 100			U 50		U 50
3. ...... London Bridge	U 86			O 53		U 80	N 100 O 100		U 66			U 43		N 12

VI. 4. ...... Farmer in the dell	U 100			O 53		U 70	O 100		U 100			O 34		U 20
5. ...... In and out the window	U 100			U 54		N 66	O 100		U 100			N 66		U 25
VII. 1. ...... Hide and seek	U 68			O 64	U 66		N 66		N 76		U 43		O 50	
2. ...... Hopscotch	U 100			O 66	O 100 U 100			N 72	U 100			O 42	O 66	
3. ...... Drop the handkerchief	U 100			N 45	U 100		O 100 N 100		O 100		U 100			U 44
4. ...... Blindfold	U 86			N 55		U 71	U 66		N 100 U 100			O 40		U 30
5. ...... Postoffice	U 72		N 64			U 62	U 100		O 100 N 100 U 100			U 75		U 25
VIII. 1. ...... Cat and mouse	U 84			N 37	U 100 O 100		N 100		N 100 U 100			N 50		O 40
2. ...... Red Rover	O 84			N 52	U 80			N 77	O 71			N 33	U 33	
3. ...... Puss in the corner	O 76			U 50	O 100			O 66		U 72		N 50	U 50	
4. ...... Pom-pom-pull-away	U 84		N 63		O 100 U 100			O 40 U 40	U 100	U 100	O 100 N 100			N 33
5. ...... Blackman	U 84			N 63	U 100	N 100	N 100		O 100 U 100	O 100		N 50		N 50

TERMAN PLAY INTERESTS AND PRACTICE TEST (*Continued*)

	X Before		XX Before		X After		XX After		1		2		3	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
IX. 1. ...... Marbles		O 70	N 66			U 72		N 100	O 88			U 25	N 36	
2. ...... Duck on rock		N 88	N 43			N 100 U 100	N 50		N 100		U 33	U 33	N 50	
3. ...... Follow the leader	O 65			N 56	O 72		U 66			O 79		U 80	U 22	
4. ...... Anty over		O 70	O 75 O 75		N 100	U 100	U 100		U 100	O 100		N 100		U 60
5. ...... Dare base on prisoner's base		O 84	N 64			O 100 N 100	N 66		N 100 U 100			U 50	O 33	N 33
X. 1. ...... Snap the whip		O 95		N 41	O 100		N 100		U 100		O 50			U 50
2. ...... Tug of war		O 77	N 57			N 66	N 80		U 100		O 60			N 60
3. ...... Rolypoly	U 88			U 55	U 100			O 62	O 100 U 100			U 50		N 29
4. ...... Jump the rope	U 92			N 55	N 100			O 75	U 100		O 50			N 47
5. ...... Leap frog	U 75		N 48			U 75		N 86		O 75		O 75		N 50

TERMAN PLAY INTERESTS AND PRACTICE TEST (*Continued*)

	X Before		XX Before		X After		XX After		1		2		3	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
XI. 1. ...... Fox and hounds		O 88	N 77		U 100		N 100	N 100	U 100		O 50			N 100
2. ...... Fox and geese		U 91		U 90	U 100	N 100	O 50 N 50		N 100	O 100 U 100	O 50			N 100
3. ...... Skinny	U 100			O 38	O 100			N 100	U 66	O 66		N 50		N 50
4. ...... Croquet		N 58	N 66			U 100	N 75			N 84	O 50 N 50		U 20	
5. ...... Bowling		O 90	O 40			U 100	N 100		N 100	O 100 U 100	O 66			N 50
XII. 1. ...... Wrestling		N 88	O 62			N 100		O 100 U 100		O 100	U 44			U 66
2. ...... Baseball		N 71	N 72		U 64			O 80		O 84	N 40			U 67
3. ...... Racing or jumping	O 63	O 63		U 53	U 45	U 45	N 100			O 55	U 33			U 58
4. ...... Handball	U 73		N 55			N 57	N 84			U 60		O 48	O 57	
5. ...... Soccer		N 80	N 75			O 66	N 100 U 100	N 100	U 73			O 100		U 50

TERMAN PLAY INTERESTS AND PRACTICE TEST (*Continued*)

Exercise 4

Put the number 1 *before* each thing you do Once or Twice a Month
Put the number 2 *before* each thing you do Once or Twice a Week
Put the number 3 *before* each thing you do Once Nearly Every Day

	1		2		3	
	Boys	Girls	Boys	Girls	Boys	Girls
I. 1. .... Boxing		N 77		U 33	N 27	
2. .... Tennis		O 86		U 31	N 22	
3. .... Volleyball	N 88		U 43			N 25
4. .... Basketball	O 53		U 53		N 32	
5. .... Football		N 72		U 66	O 50	
II. 1. .... Play with dolls		O 46		U 35		N 39
2. .... Play "dress up"		O 65	N 33			N 43
3. .... Play house	N 66		U 100			U 37
4. .... Play store	U 80			U 38	N 33	
5. .... Play school	N 50			U 42	U 66	
III. 1. .... Simon says thumbs up	U 77			U 35	N 27	
2. .... Play church	ONU 100	U 100		N 47		O 15
3 ...... Dominoes		O 83		U 35		N 24

TERMAN PLAY INTERESTS AND PRACTICE TEST (*Continued*)

III.—*Continued*						
4. .... Crokinole	OU 100	U 100		O 17	N 50	
5. .... Parchesi	O 87			U 37	N 25	U 25
IV. 1. .... Tiddledy-winks	U 100		N 40		O 18	
2. .... Backgammon	OU 100	N 100	N 100	O 100		
3. .... Authors	U 100		N 50			U 33
4. .... Snap	ON 100			U 42		N 22
5. .... Guessing games	U 68			N 56		N U 24
V. 1. .... Cards	U 44		N 53		O 30	
2. .... History cards	U 66	N 66		O 45	O 57	
3. .... Geography cards	U 86			O 39	O 63	
4. .... Charades	U 100		N 100		O 50	
5. .... Anagrams or word building		O 75		U 37	O 33	
VI. 1. .... Solve puzzles		O 57		U 39		U 39
2. .... Checkers	U 48		N 50		O 33	
3. .... Chess		N 84	O 40		N 33	
4. .... Pool	N 72		O U 40	U 33		N U 33
5. .... Billiards	U 100	N O 100		U 50	N 50	

TERMAN PLAY INTERESTS AND PRACTICE TEST (*Continued*)

Exercise 5 Read each question and draw a line under the correct answer.			Boys			Girls		
			O	N	U	O	N	U
1. Did you ever catch a fish?	Yes	No	72	73	67	42	33	51
2. Did you ever shoot any game?	Yes	No	15	27	28	16	5	16
3. Did you ever make a trap?	Yes	No	26	43	21	7	2	3
4. Have you ever made a bow and arrow?	Yes	No	83	76	70	39	22	16
5. Have you ever made a kite?	Yes	No	26	58	67	36	31	27
6. Have you ever set up an electrical apparatus?	Yes	No	41	27	25	2	5	8
7. Did you ever make a waterwheel?	Yes	No	15	18	18	--	5	3
8. Have you ever made a canoe or boat one could ride in?	Yes	No	15	14	3	73	2	3
9. Can you row a boat?	Yes	No	82	76	57	44	52	40
10. Have you ever learned the wireless code?	Yes	No	23	11	28	2	5	8
11. Can you stand on your head?	Yes	No	26	45	34	12	27	19
12. Have you ever climbed a tree?	Yes	No	85	86	87	67	74	73
13. Did you ever swim one hundred feet?	Yes	No	61	62	32	45	38	24
14. Can you dive?	Yes	No	61	54	42	42	48	27
15. Can you chin yourself? (Chin a pole?)	Yes	No	54	60	58	21	32	38
16. Can you walk on your hands?	Yes	No	13	21	34	9	22	14
17. Can you turn a handspring?	Yes	No	24	40	30	19	26	25
18. Are you a Boy Scout?	Yes	No	9	11	9	--	--	--
19. Are you a first-class Boy Scout?	Yes	No	3	3	31	--	--	--
20. Are you a Bluebird?	Yes	No	--	--	--	2	--	6
21. Are you a Campfire Girl?	Yes	No	--	--	--	2	10	6
22. Are you a Girls' Reserve?	Yes	No	--	--	--	5	10	3
23. Are you a Girl Scout?	Yes	No	--	--	--	7	12	11
24. Can you read the time from a sundial?	Yes	No	43	42	16	19	31	22
25. Have you ever set up a tent?	Yes	No	60	69	46	29	24	19

TERMAN PLAY INTERESTS AND PRACTICE TEST *(Continued)*

Exercise 5 *(Continued)* **Read each question and draw a line under the correct answer.**				Boys			Girls		
				O	N	U	O	N	U
26.	**Have you ever hiked eight miles a day?**	Yes	No	79	59	50	30	49	28
27.	**Have you ever cooked a meal?**	Yes	No	70	55	50	58	48	46
28.	**Have you ever made a dress that was good enough to wear?**	Yes	No	22	8	6	12	31	8
29.	**Have you ever had a paper route or sold papers?**	Yes	No	27	31	6	2	5	11
30.	Have you ever milked a cow?	Yes	No	30	33	32	14	20	16
31.	Have you ever hitched a horse?	Yes	No	30	38	28	7	10	6
32.	Have you ever driven a horse?	Yes	No	64	72	62	35	24	38
33.	Can you do the standing broad jump?	Yes	No	81	73	77	33	51	42
34.	Have you ever been elected to any office of special honor?	Yes	No	48	54	44	47	50	31
35.	Have you ever been captain of an athletic team or the like?	Yes	No	27	59	43	31	42	22
36.	Do you belong to a football team?	Yes	No	55	50	39	7	12	5
37.	Do you belong to a baseball team?	Yes	No	45	54	54	7	12	8
38.	Are you a member of a debating team?	Yes	No	9	7	25	--	12	6
39.	Do you belong to a hiking club?	Yes	No	13	21	13	14	19	8
40.	Do you belong to a sewing club?	Yes	No	--	--	--	12	14	16
41	Do you belong to a track team?	Yes	No	3	33	12	5	2	5
42.	Do you belong to a gardening club?	Yes	No	3	7	9	--	2	3
43.	Do you belong to any kind of musical or dramatic club?	Yes	No	24	42	31	14	29	14
44.	Do you belong to any kind of church society or church club?	Yes	No	48	50	34	40	86	30
45.	Have you ever taken part in a play?	Yes	No	76	76	79	88	5	11

TABLE XXXIII (*Continued*)

EXERCISE 5

Boys				**2**	**4**	**2**	**14**	**18**	**19**
Girls				**1**	**3**	**3**	**11**	**12**	**19**
Total				**3**	**7**	**5**	**25**	**30**	**38**
Sum of Totals	**73**	**76**	**74**	**73**	**86**	**88**	**38**	**47**	**52**

The sum of the percentage totals suggests the following interpretation: (1) that "active-solitary" games as fishing, bicycle riding, etc., are about equally liked and indulged in by all body-weight groups; (2) the under-weight group has the highest preference for the "active-social" games, exceeding the over-weight group by 15 per cent and the normal-weight group by 2 per cent; (3) the under-weight group shows 14 per cent more than the over-weight group and 5 per cent more than the normal-weight group preferring "mildly social but relatively quiet" activities. In conclusion, the three groups prefer "active-social" and "active-solitary" to "mildly social" games.

ASSOCIATION TESTS

The Wyman Test.—The Wyman Association Test [115] was designed on the idea that "an individual's characteristic tendencies of thought, emotion, and will may reveal themselves in the apparently trivial responses to stimulus words in such a test," and so it was thought that if such a thing could uncover mental complexes which lead to abnormal behavior, why should not interest trends be so revealed? Three types of interests were selected for the investigation: (1) intellectual interests, (2) social interests, and (3) activity interests. The result of the investigation yielded two comparable lists of 60 words each.

The first list of 60 words was given to the three groups of this study. The stimulus words were presented visually and at the same time pronounced by the examiner while the subjects responded by writing (a rate of one stimulus word was allowed to every eight seconds). The results were not scored according to Wyman's procedure but tabulated, percentages found, and then summarized. The accompanying sheet of comparative results shows the highest percentage of children giving that one word as an association with the stimulus word; all association words given as responses were not placed upon this sheet when

COMPARATIVE RESPONSES TO WYMAN ASSOCIATION TEST

(Intellectual, Social, and Activity Interests)

(In terms of groups showing the highest percentage of certain responses)

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
1 summer						20 hot
3 diamond	12 jewel	22 stone				
4 tire					18 rubber	
5 dog	20 animal	23 animal				
6 fair		13 unfair				
8 help	8 drowning				4 cried 4 save	
9 nature		13 birds			16 good	
10 active	12 quick	9 girl	8 yes	6 act 6 run	8 inactive	8 move 8 lively
11 dream						8 night 8 bed
12 shock				6 surprise 6 hurt 6 fright		
14 dislike				20 like		
16 go		10 stay	10 stay 10 away			15 home
17 angel			8 good 8 nice			
18 nice				20 bad		10 pretty
21 wish						15 hope
22 museum					10 history	
23 delighted			23 glad			
25 cave	10 den					
26 pleasant	8 joy					
29 range					12 gas	15 stove
30 admire	22 light					
35 learn	8 study 8 know					23 study
38 platform					8 stand	
39 pity	12 sight				8 poor	
40 thrill	18 excited	9 joy			8 movies	
44 master	14 dog 14 man		10 head			
47 power						15 strong
48 interested		7 uninterested		10 not 10 books	14 attention	10 like
49 fond		20 love				
50 trip	6 train 6 vacation	7 Europe	6 mountain	8 journey		
51 make		9 good		16 cake	12 to do	
53 aim	18 shot	19 shoot		16 arrow		
55 exercise		7 athletics	24 gym			
58 fire			8 engines 8 hot	8 burn	8 engines 8 hot	
59 great				12 small		8 wonderful
60 like	16 good	11 you	20 like	12 fond	20 like	

common to all, as it was desired that differences of response should be so shown as to reveal distinct interests. If association responses were omitted the percentage as summarized appears alone.

The results are interesting, since there are some responses that might be considered singular to each of the body-weight groups and their underlying interests. To illustrate: the under-weight group gave the word "history" as the most frequent response to the stimulus word "museum," which may be indicative of an intellectual interest which is in harmony with one of their play interest frequencies, showing them to prefer, as a third choice, "mildly social but relatively quiet" activities which call upon their powers of imagination and logical thought. Other association responses could be discussed in the same manner, but the discussion would be too elaborate for the present purposes; therefore the brief summarized tabulation was made and here presented along with the accompanying form arranged so as to be easily read and comparatively interpreted.

An Experimental Association Test.—A test of 82 stimulus words was devised so as to give the subject matter content some positive and negative concepts or ideas usually associated with body-weight. The procedure used in giving the test was identical with the Wyman procedure; the scoring was done as described above. The results are shown along with the corresponding accompanying form, indicating the percentage of each group who responded by a word which the other group did not use for words found in two or more groups were excluded.

Some of the interesting responses to stimulus words often associated with extremes of weight are: in response to "eat" 10 per cent of the over-weight boys answered "hungry", while 13 per cent of the over-weight girls responded with "bread"; 42 per cent of the under-weight boys gave "skinny" in answer to "thin", while 21 per cent of the girls of the same group gave the same answer; the over-weight group gave 17 per cent of "Fatty or Fat" in answer to nicknames; and in answer to "fat" the two extreme body-weight groups gave their opposites as "skinny" (over-weight group) and "stout" (under-weight group). Other responses should be noted as those in answer to nervous and embarrassed.

RESPONSES TO EXPERIMENTAL ASSOCIATION TEST

(Body-weight, Foods, Personal Appearance, and Activity Associations)

(Expressed as the highest per cent for the group)

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
1 black					22 dark	34 dark
2 eat	10 meat 10 hungry	13 bread		22 ate		
3 football	22 baseball	27 play				
4 thin					42 skinny	21 skinny
5 drink			14 milk			
6 bread						18 food
8 sleep			18 tired		26 night	
10 dancing	6 teacher	9 singing	6 music 6 walking 6 school			8 fun
11 vegetables		9 greens		18 pints		
12 meat			8 food			
13 angry				48 angry		
14 lonesome	14 lonely					
15 nicknames	10 fat	7 fatty	6 Red		8 Dick	
16 milk	10 white					
18 fat	24 skinny					15 stout
19 parties	8 games			14 dance	14-	
23 pretty					20 beautiful	21 girl
25 punctual				16 tardy		
26 sulky					12-	
27 playground						18 playing
28 baseball			12 ball			18 bat
29 reading		25 check				
30 music					10 singing	
32 girls (or boys)						15 men
34 candy						13 good
35 song					22 music	
36 sleep				12 well		31-
37 cake				12 candy 12 sweet		
39 graceful	6 girl 6 clumsy	9 dainty			12-	
42 pie						18 good
44 heart	10 red	13 good		12 beat		13 beating
45 swimming	12 good		18 water		18 water	
47 feet	10 legs				13 shoes	
48 walking			10 feet		10 feet	
49 dining						17 eat
50 jealousy	10 mad		10-			
51 bulky						18-
52 worry		10-	8 anxiety 8 think			
53 exciting		14 thrill	4 picture 4 quick 3 nervous 4 exalted			

	Over-weight		Normal-weight		Under-weight	
	Boys	Girls	Boys	Girls	Boys	Girls
54 stubborn......		9 mean				
55 Benny Leonard					20 boxer	
56 big...........		21 tall				
57 pity...........					10sympathy	
58 nervous.......	6 shiver		14 worried	8 afraid	10 worried	13 exciting
59 embarrassed...	6 not	8 ashamed		14-		
60 uneasy........						15 hard
64 anxious........	10 nervous	7 excited				13 worry
66 Jack Dempsey .					14 boxer	
67 lazy...........	12 idle					
68 talkative......					16-	
73 Babe Ruth....						36 baseball player
78 cry...........		18 sad			12 laugh 12 tears	
79 good natured...	10 nice				16-	
81 prompt........						13 on time
82 obedient.......		27 obey			27-	

GENERAL AND POPULAR INTERESTS

Thirty-two questions reveal general and popular interest reactions as shown in the accompanying summary of tabulations attached to the form sheet (pp. 108-109).

Some of the interest reactions are interesting in that they are the expression of common interests, while some are obviously singular to the group expressing them: for example, as might be expected, the people of popular fame are consistently mentioned by all groups; the answers peculiar to the group are indicated in the answers given to such questions as "name the thing outside school work that you do best," "name the thing outside of school work that you do poorest," and so on. The word "personality" is arbitrarily used as a tabulation caption in order to cover a multitude of things as "she's sweet," "pretty," "cute," and the like, but the word "interesting" occurs as recorded, as do all the other words.

SUMMARY

1. Responses to the Terman Play Interests and Practice Test were indicated in a summary, according to Terman's threefold classification, and showed that all three body-weight groups pre-

ferred "active social" and "active solitary" games, plays, and amusements, to those described as "mildly social but relatively quiet."

2. The Wyman Association Interest Test of 60 stimulus words was given according to the procedure suggested, but the test results were scored differently in that responses were assembled in terms of total responses made and then further summarized so as to show only those words answered differently by all the groups (common word responses were omitted). The results were presented in a comparative form, and showed associated interest responses that were singular to the group in response to the stimulus words museum, trip, etc.

3. An experimental association test of 82 stimulus words was devised to include those words thought to be associated with extremes of body-weight. The method of giving was the same as that for the Wyman test, while the scoring and recording was that described above. The stimulus words that were significantly answered and peculiar to the extreme body-weight groups were "eat", "thin", "nicknames", "nervous", and "embarrassed".

4. A general and popular interest questionnaire gave answers common to all groups, but some answers were independent of other group responses, especially the answers to such phrases as "name the thing you do best," "name the school subject you like best," and the like.

GENERAL AND

(Expresses words and phrases which

	Over-weight	
	Boys	Girls
1 Who is your favorite movie actor?	33 Doug. Fairbanks	17 Doug. Fairbanks
2 Why do you like him best?	22 entertaining	36 acting
3 Who is your favorite movie actress?	35 Mary Pickford	17 Mary Pickford
4 Why do you like her best?	27 acting	45 personality
5 Have you any other favorite actor?	29 Tom Mix	13 Doug. Fairbanks
6 Why do you pick him?	27 entertaining	30 acting
7 Have you any other favorite actress?	33 no	19 no
8 Why do you select her?		
9 What man in public life do you admire other than our President?	27 Walker	40 Smith
10 Why do you select him?	39 relative	42 good
11 Who is your favorite football star?	83 Red Grange	47 Red Grange
12 Why do you like him?	39 good	62 good
13 Who is your favorite baseball star?	30 Babe Ruth	74 Babe Ruth
14 Why do you pick him?	47 good	66 good
15 Who is your favorite tennis star?	54 Tilden	32 none
16 Why do you pick that person?	48 personality	46 personality
17 Who is your favorite track star?	63 Paavo Nurmi	45 have none
18 Why do you select him?	74 swift	
19 Who is your favorite prize fighter?	54 Jack Dempsey	85 Jack Dempsey
20 Why do you select him?	60 I like him	59 I like him
21 Who is your favorite book character?	16 Mark Twain	24 Alcott
22 Why?	60 interesting	82 interesting
23 Name the school subject in which you do the best.	29 arithmetic	29 spelling
24 Name the thing outside of school work you do best.	13 swim	18 read 18 sew
25 Name the thing outside of school work you do poorest.	30 run	15 sew
26 How many hours do you read each day other than on school work?	25 2 hrs.	39 1 hr.
27 Give the school subject you like best.	34 arithmetic	33 arithmetic
28 Give the three school subjects you like best	26 arithmetic (1st choice)	26 arithmetic (1st choice)
29 Give the books you like very much.	20 Huck. Finn	23 Little Women
30 What is your ambition physically?	39 football star	28 swimmer
31 What is your ambition intellectually?	72 very wise	88 very wise
32 What is your ambition vocationally?	33 lawyer	28 school teacher

POPULAR INTERESTS

received the highest percentage for each group)

Normal-weight		Under-weight	
Boys	Girls	Boys	Girls
35 Tom Mix	15 Doug. Fairbanks	43 Doug. Fairbanks	11 Harold Lloyd
29 entertaining	36 entertaining	16 entertaining	16 acting
57 Mary Pickford	18 Mary Pickford	42 Mary Pickford	33 Mary Pickford
41 acting	53 personality	38 acting	35 personality
29 yes	23 no	23 Harold Lloyd	15 Harold Lloyd 15 yes 15 Tom Mix
42 entertaining		35 entertaining	31 entertaining
55 no	25 no	24 no	
37 Walker	40 Gov. Smith	36 Smith, Gov.	42 Walker, Mayor
27 office holder	59 good	40 personality	23 office holder
82 Red Grange	62 Red Grange	98 Red Grange	77 Red Grange
60 good	50 good	65 good	55 good
49 Babe Ruth	65 Babe Ruth	71 Babe Ruth	76 Babe Ruth
46 good	59 good	62 good	53 good
57 Tilden	32 Helen Wills	39 Eugene	65 Helen Wills
55 personality	50 personality	70 personality	60 personality
21 have none	56 have none	50 Paavo Nurmi	33 Paavo Nurmi
		93 swift	65 swift
54 Jack Dempsey	72 Jack Dempsey	50 Jack Dempsey	88 Jack Dempsey
61 I like him	63 I like him	53 I like him	72 I like him
20 Mark Twain	26 Alcott	17 Tom Swift	12 Alcott
24 interesting	56 interesting	47 interesting	87 interesting
33 spelling	24 arithmetic	44 spelling	25 spelling
24 football	13 dance	16 baseball 16 errands 16 skate	18 dance
15 football	13 sew	13 fight	17 sing
30 2 hrs.	51 1 hr.	26 2 hrs.	38 2 hrs.
35 arith. 3 gram.	26 geog. 28 gram.	25 gram.	22 gram. 22 arith.
30 hist. (1st choice)	26 hist. (1st choice)	21 hist. (1st choice)	18 hist. (1st choice)
17 history	9 Little Women	22 Tom Swift	19 River Boys
23 baseball star	15 teacher	35 baseball star	38 swimmer
62 very wise	77 very wise	66 very wise	72 very wise
19 lawyer	23 school teacher	24 lawyer	28 school teacher

CHAPTER X

CONCLUSIONS

The purpose of this investigation was to determine, if possible, traits that may be said to characterize children of three well defined body-weight groups, namely, children who are considered over-weight, normal-weight, and under-weight; it was considered important to ascertain these traits in order to verify or disprove certain current speculations concerning them. The nature of some of these traits has been indicated in considerable detail in the preceding chapters; the summaries of each chapter make it unnecessary to summarize at this point in any great detail. However, a few of the important results with implications for future research will be indicated.

Throughout the dissertation demonstration showed that, in addition to the variation caused by the original refined selection of experimental groups for this study, the variability was further increased by so few numbers in each of the three body-weight groups (104 each) and by the division of these groups into sex-groups (52 each). Though the groups used in the statistical computation were small (representing groups within groups for the whole group when selected at random), many of the results for the total body-weight groups have more than chance significance, as indicated by the differences of the means when evaluated by the probable errors. Whenever possible complete distributions of all groups were given or the means and sigmas were used to indicate the middle two-thirds of the range so as to give information for the major number in each group.

Objective measures were used throughout and followed very closely where directions were standardized, and only in the case of the Terman Play Interests and Practice Test and of the Wyman Association Test were modifications of procedure made. In these instances the method of scoring was exceedingly laborious and the test too long for the time allowance necessary to the time budget of this study (as described in Chapter II). Nevertheless, incomplete and fragmentary as the data are, when analytically considered there are some findings of fair significance and interest. The outstanding findings in reference to these body-weight groups, when all are summarized, are many, but only the most important ones will be reviewed here.

RACIAL AND SOCIAL ORIGIN

First, data on racial origin indicated that there was an excess of the English, German Jewish, Italian and Russian Jewish stocks within the over-weight group, no doubt contributing to their body-build according to the laws of heredity as regards remote ancestry.

The over-weight group seemingly had the highest per cent (20.4) of over-weight people among their relatives, when other body-weight groups were considered. In other words, one fifth of their immediate ancestry was over-weight. This group also had 74.6 per cent of normal-weight relatives as well as 4.8 per cent of under-weight relatives.

The over-weight group showed the greatest number of fathers in commercial occupations, indicating, because of the probable financial return, that these children probably have luxuries that can be purchased which are conducive to increase body size.

ANTHROPOMETRICAL MEASUREMENTS

The calculation of the body bulk or weight, according to the Baldwin-Wood Height-Weight-Age Tables and the Baldwin Measuring Scale (which is based upon weight-height coefficient calculation), suggested some fallacies. Chief among these was that of the obvious neglect of those children who were of large bone (and probably heavy bone) development. Children who fulfilled the criterion of selection for the over-weight group, that of 15 per cent and over the norm in weight, were when observed quite normal-weight in appearance (and in a few cases almost thin), indicating that their deviation from the norm in pounds or per cent was not a good index to their state of fatness and leanness. Excluding the extreme linear and lateral types, these standards work well (especially when used with the new Wood-Rowell development chart).

The DuBois body surface area was logically much better for all types, including the linear and lateral types. The

DuBois surface area was originated when it was observed that men who were of the same body-weight varied in appearance because of differences in height, and the contrary was true. DuBois and DuBois conceived the idea of determining a measure of fatness and leanness from this by taking people of varying heights and weights and encasing them in knit wear which was as carefully fitted as a glove; then by fitting paper to this textile which had a glued side they were able to measure the modelled glove form (after it had been dried, removed, and cut) for square surface area. Thus the DuBois Surface Area Chart evolved as a measure of fatness and leanness. By using this chart the usual criticism of comparing Italian children with standard weight norms is met, since it is a build index and determines not weight as related to height but height and weight as related to surface area or the state of body fatness or leanness.

Standing height measurements indicated that the over-weight children were taller than the normal-weight children as revealed by the difference of the means (1.52), which was almost six times the probable error (.25).

Strength of grip as an index of bodily strength indicated that the over-weight group was stronger than the normal-weight and under-weight groups. The difference of the right hand means of the over-weight and normal weight groups was 2.87 with a probable error of .80; while the left hand mean difference was 3.41 with a probable error of .76. The over-weight and under-weight groups when compared yielded a mean difference of 5.64 with a probable error of .80 for the right hand while the left hand mean difference was 6.26 with a probable error of .73.

Vital capacity was considered as an index of physical condition and capacity and revealed that the over-weight group mean deviation from the Dreyer norm (based on body-weight) was –.47 liters as compared with –.16 liters for the normal-weight group. The deviation when transposed to cubic centimeters showed a deviation for the over-weight group of –470 cc. from the norm or –310 cc. more than the normal-weight group.

Rate of movement as an index of voluntary motor ability when measured by the Tapping Test showed that body-weight had little or nothing to do with speed of movement. The difference of the means of the over-weight and normal-weight groups for the right hand was 2.87 with a probable error of 2.27; while the difference of the means for the left hand was 1.69 with a probable error of 2.23.

Steadiness of motor control, or the measurement of involuntary movement for the total over-weight and normal-weight groups, gave a mean difference for the right hand of 3.48 with a probable error of 1.53 in favor of the over-weight group while the left hand differences were negligible.

PHYSICAL AND HEALTH HISTORY

The over-weight group weighed at birth 1.13 pounds, on the average, above normal. (Pounds: over-weight mean = 8.5, S. D. 1.13; normal-weight mean = 7.7, S. D. 0.4; under-weight mean = 8.28, S. D. 0.9.) The present onset of body-weight condition showed when the sex-group means were averaged that the over-weight group started gaining at about 6.67 years of age.

About 35 per cent of the over-weight group had fat localized about the girdle, 15 per cent had fat evenly distributed, and 49 per cent had other distribution types, in so far as they could be judged without the removal of clothes.

The over-weight group had more infectious diseases and more miscellaneous diseases when compared with the other weight groups; this probably indicates the nature of fat which reduces immunity to disease in that it does not release the heart, lungs, and blood supply to combat diseases.

Posture as rated on a scale of 5 showed the over-weight children had the poorest posture with a tendency to "slouch". However, the frequency of flat feet and pronated ankles, usually associated with the over-weight, was no greater than among the other groups.

The over-weight children had a greater frequency than the normal-weight group of more sexually mature individuals as indicated by the signs usually associated with sexual maturity.

NUTRITIONAL STATUS

The basal metabolic rate showed the over-weight group well within the normal range of 10 per cent plus and minus and only 17.40 per cent were outside the range in the negative direction,—which is the direction of the metabolic rate range associated with endogenous obesity. Then, other things being equal, according to the basal metabolism results found thus far (all must have second mornings of the basal test before June as well as those omitted from the final inclusion for reasons explained on p. 50), probably only 13 per cent of these children are fat not because of life habits or the probable high efficiency of the organs directly concerned with fat metabolism but because they have an endocrine gland disturbance.

INTELLIGENCE AND ACHIEVEMENT

When the total body-weight groups were considered the conclusion was reached that body-weight had little to do with the possession of a certain degree of intelligence. The only difference indicated was the mental age mean difference of the over-weight and normal-weight groups of .66, which was a little more than a chance difference since it was three times the probable error of .20. The differences in intelligence quotients were negligible.

The results of the achievement tests yielded the following mean differences which were significant since they were at least three times the probable errors: (1) the over-weight group was superior to the normal-weight group in reading ability (Diff. of *M's* = .74 and the P. $E._{dM}$ = .22) as well as to the under-weight group (Diff. of *M's* = .73 and the P. $E._{dM}$ = .23); (2) the over-weight group was superior to the under-weight group in spelling ability (Diff. of *M's* = .57 and the P. $E._{dM}$ = .19); (3) the over-weight group excelled the normal-weight group (Diff. of *M's* = .50 and the P. $E._{dM}$ = .13) and the under-weight group (Diff. of *M's* = .51 and the P. $E._{dM}$ = .13) in arithmetic ability; (4) educational achievement based upon the Ge score or the composite of 1, 2, and 3 above indicated that the over-weight group achieved most when compared to the normal-weight group (Diff. of *M's* = .51 and the P. $E._{dM}$ = .14) and to the under-weight group (Diff. of *M's* = .61 and the P. $E._{dM}$ = .15); (5) the over-weight group had a higher Gi score or mental age for grade than the normal-weight group (Diff. of *M's* = .71 with a P. $E._{dM}$ of .19); (6) the Gp or grade progress index for mental age indicated that the over-weight group was superior to the normal-weight group (Diff. of *M's* = .59 and the P. $E._{dM}$ = .15) and to the under-weight group (Diff. of *M's* = .58 and the P. $E._{dM}$ = .17).

PERSONAL DATA

When the total body-weight groups were compared as to will-temperament traits the three groups seemed more alike than different, with the following exceptions: (1) the over-weight group had greater "speed of reaction" than the under-weight group (Diff. of $M's = .68$ and the P. $E._{dM} = .18$); (2) the over-weight group surpassed the under-weight group (Diff. of $M's = 1.34$ and the P. $E._{dM} = .34$) in experiencing "freedom from load" as did the normal-weight group (Diff. of $M's = 1.19$ and the P. $E._{dM} = .34$); (3) the over-weight group surpassed the under-weight group (Diff. of $M's = 1.61$ and the P. $E._{dM} = .30$) in expressing 'self confidence' as did the normal-weight group (Diff. of $M's = 1.18$ and the P. $E._{dM} = .31$).

The Woodworth-Matthews personal emotional data sheet revealed that the over-weight group had the greatest tendency to fears and worries of all the body-weight groups considered.

A personal data questionnaire gave the results of 140 questions which suggested that there are moral, physical, mental hygienic, and aesthetic aspects to the problem of body size.

INTERESTS

Intellectual, social, and activity interests of the over-weight group were like those of other children with few exceptions.

Associations with their state of body weight were revealed on an association test to the extent that words as "eat," "hungry," "nicknames," and the like brought forth responses from the over-weight group unlike those for the other two body-weight groups.

The three groups, as shown in the Terman classification of play interests, preferred "active social" and "active solitary" to "mildly active" games. This seemingly indicates that they like all active games and prefer less to play games requiring them to sit, as in "checkers".

FINAL CONCLUSION

In conclusion, no doubt some or all of these data and their interpretations will be tested by future research. The appeal of these data, however, is to the educator for a better understanding of individual differences which seemingly is to the intent that, in so far as these measurements have gone, over-weight children are not very different from other children though there are a few differences which are better than chance differences weighting the positive side.

The results of experimentation with diet, medical care, and other environmental influences may have at some future time many important suggestions for the administrator in education in regard to the problem of the over-weight child. However at present, it is difficult if not impossible to explain by the environmental hypothesis the relatively superior educational achievement of the over-weight group.

It is hoped that later studies will add something to our present knowledge about the origin of adiposity, methods of reduction to warrant the best correction, and the optimum amount of adiposity to insure the individual's fullest physical and mental efficiency.

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